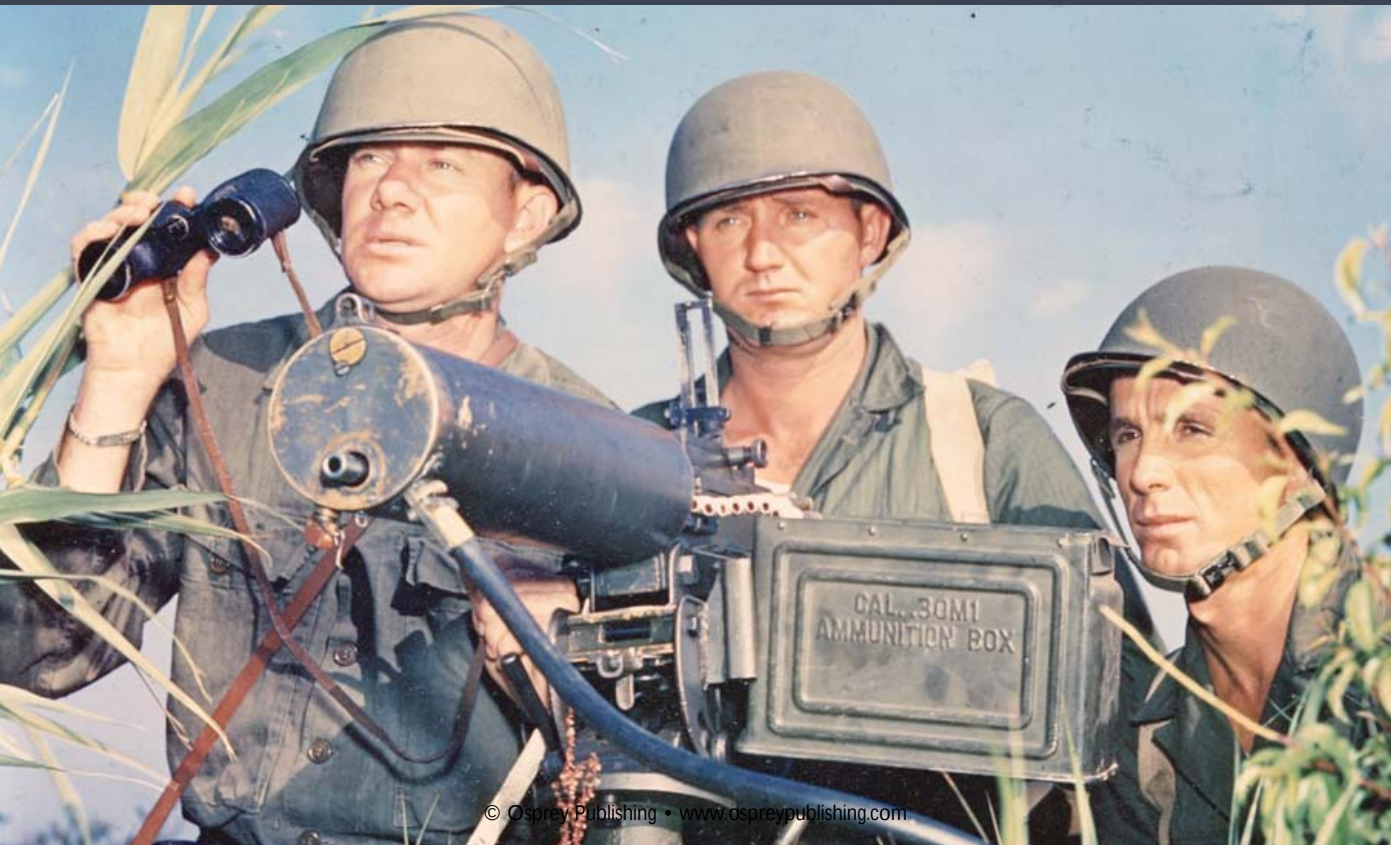




BROWNING .30-CALIBER MACHINE GUNS

GORDON L. ROTTMAN





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Series Editor Martin Pegler

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INTRODUCTION

Any number of weapons serving in World War II can be called iconic. Such renowned weapons ranged from handguns to rifles to machine guns. Few will argue that the various Browning .30-caliber machine guns should not be included among these. The “.30-cal” machine gun has had a long and honorable service record as the predecessor and little brother of the Browning .50-caliber.¹ First adopted in 1917 and seeing World War I service, the .30-caliber appeared in new models through the interwar years and remained in regular use with US forces into the 1970s.

There were three basic versions of the Browning “thirty”: the M1917 heavy water-cooled, M1919 light air-cooled, and AN-M2 aircraft guns. (It must be pointed out that the AN-M2 is not a variant of the M1919 as is so often suggested. It was a separately developed weapon with few interchangeable parts.) The “thirty” has been employed in every imaginable machine-gun role – antipersonnel, antiaircraft, aircraft defensive and offensive armament, defensive and offensive armament aboard vehicles (armored and soft-skin), mounted on watercraft, and as a training weapon. A large number of “Brownie” variants have been developed, including licensed foreign models.

To soldiers, the various Brownings were known as the “1917 water-cooled” or “heavy machine gun” and the “1919 air-cooled” or “light machine gun.” The term “tank gun” referred to those fitted in fixed mounts on AFVs. These were usually “coaxial guns,” that is, mounted in the main gun’s mantle. Such guns were aligned to be sighted using the main gun’s optical sight. The term “fixed gun” also applied to aircraft guns. These were guns mounted in aircraft wings, engine cowlings, or turrets. Turret guns were elevated and traversed, of course, but the guns were fixed to the trainable mount. “Flexible guns” were handheld weapons used in aircraft aft cockpits, bombardier compartments, waist positions, etc. Flexible guns were mounted aboard certain types of landing craft and other small craft,

and were also found on AFVs in side sponsons, bow positions, in crew compartments on side or pedestal mounts, and atop light tanks.

While the M1917 saw some use in World War I, the M1917A1, the M1919 series, and AN-M2 aircraft guns were developed between the wars, and further development continued during and even after World War II. The heyday of the .30-caliber Brownings was World War II and the Korean War. They began to be replaced at the end of the 1950s, but remained in service into the 1970s and are still used in some countries. As this book's title suggests, most of these guns were .30-caliber, commonly called the .30-06, the same round used in various US-issue rifles and the BAR. Limited use was made of the 7.62mm NATO round in the 1960s and several countries used guns of that caliber, either conversions or newly produced under license. The Commonwealth countries made wide use of aircraft versions in .303in caliber. Belgian license-produced Brownings were sold to countries all over the world in a variety of rifle calibers. Some countries were equipped with license-built or US-made Colt export guns between the world wars.

The various Browning rifle-caliber light machine guns discussed here are among the most numerous produced and widely used weapons of this class ever designed. From the 1901 prototype, and considering its offspring can still be found in use, these Browning guns have now been in service for well over a century.

A gunner aboard a landing craft vehicle and personnel (LCVP) searches the sky for enemy aircraft. He mans an M1919A4 fitted with a $\frac{3}{8}$ in-thick shield. LCVPs and other small assault landing craft typically mounted two M1919A4s for air defense. They were seldom used for suppressive fire directed ashore. (Tom Laemlein/Armor Plate Press)





DEVELOPMENT

Browning's versatile "thirties"

ORIGINS

Before 1917

The US Army, as per most armies of the era, was slow in embracing the newfangled machine gun that appeared on the military scene in the 1890s. The United States employed several machine-gun models prior to World War I. The first of these was the Browning-designed Colt M1895,² the infamous "potato-digger." It was more widely used by the Navy and USMC than by the Army. Its nickname was derived from the motion of the articulated operating lever beneath the barrel: when fired from a mount low to the ground, the gas-operated weapon's jointed operating rod literally dug up the ground. During the 1898 Spanish–American War, some state militia units called to active duty were equipped with Colt guns while there were no machine guns in the regular Army. The Army actually implemented a regulation directing that militia units (designated National Guard from 1903) could not organize units that did not exist in the regulars. The role of machine guns was far from being understood.

The Army's first "official" machine gun was the Maxim M1904, produced both by Colt in the United States and by Vickers in Britain, but used only in limited numbers. The next was the French-designed, US-made (Springfield Armory and Colt) M1909 Benét-Mercié automatic machine rifle, a rudimentary LMG meant to be more maneuverable than the heavier tripod-mounted weapon. A Hotchkiss product, the complicated

2 The Navy designated the Colt as the Mk I in 6mm Lee in 1897 and later in .30-40 Krag as the Mk I Mod 1 – and still later in .30-06 with the same designation. Although seeing limited procurement from 1896 by the Army in .30-40, it was never formally adopted. The Army converted the weapon to the .30-03 round in 1904 and redesignated it the M1902. In 1906 the Colt was again rechambered for the .30-06 and redesignated the M1906.

Benét-Mercié was provided with a bipod, but a tripod with a gunner's seat was also available. A much-updated version of the Colt "potato-digger" was developed, eliminating the agricultural tilling feature and with improved cooling, and adopted as the M1914.

During this period the hand-cranked, rotary Gatling guns were still available; the later models were even chambered in .30-40 and .30-06, and Gatlings were not declared obsolete until 1914. The Army, knowing it was in need of machine guns, adopted the British Vickers Mk I in .30-06 as the M1915, to be built by Colt.³ They would not become available until after the United States entered World War I; 12,125 were produced. Lewis LMGs were purchased beginning in 1916, but in .303in British.

Into World War I

By early 1917 the United States possessed 670 M1909 Benét-Merciés, 353 M1917 Lewis guns, 282 M1904 Maxims, 148 M1914 Colts, and 125 M1915 Vickers. All except the Lewis and Vickers were obsolete and only the Vickers and Maxim were water-cooled, as was needed for the long-range sustained-fire role. What was needed was a rugged and reliable weapon that could be mass-produced at a reasonable cost. The Colt-built Vickers M1915 was a good gun, but complex, and slow and costly to make. There was, of course, a preference for an American design. It made little difference if Sir Hiram S. Maxim (1840–1916) – the inventor of the Maxim and Vickers guns, who had received British citizenship in 1900 – and Benjamin B. Hotchkiss (1826–85) were Americans. The Hotchkiss Mle 1914 was actually designed by an Austrian cavalryman, Baron Adolf Odkolek von Augeza (1854–1917), and the rights purchased by the Hotchkiss firm. Their weapons were largely viewed as being British, German, and French, as these countries had adopted them before the United States did.



The M1895 Colt-Browning "potato-digger," the United States' first self-powered machine gun. (Gonzolito/CC-BY-SA-3.0)

3 See Martin Pegler, *The Vickers-Maxim Gun*, Weapon 25, Osprey Publishing.

John M. Browning – the Edison of guns

John Moses Browning was born on January 23, 1855 in Ogden, Utah Territory to Jonathan Browning, a Midwestern gunsmith who settled in Utah in 1852. Jonathan was recognized for producing early repeating rifles, known as cap-and-ball slide rifles owing to a harmonica-like sliding bar magazine. John and his younger brother, Matthew, were apprentices under their father. By his teens John was making rifles himself. He began to learn his trade by reconditioning an old lathe. Browning never had any formal engineering education. He learned his trade from his father, practical experience, and trial and error. Of course once he began working at Winchester, Colt, and FN he learned a great deal from their engineers.

Browning was granted his first patent in 1879, a single-shot falling-block rifle that caught the attention of Winchester Arms, which produced it from 1885. John and Matthew opened a hardware store, J. M. Browning and Brothers, with John turning out guns and Matthew running the business. Their other four brothers were also involved. John went on to design a number of legendary arms for Winchester – the Model 86, 92, 94, and 95 lever-action rifles; Model 97 pump-shotgun; Remington Model 8 rifle and Model 17 pump-shotgun; Stevens Model 520 pump-shotgun; and a Browning automatic shotgun. Browning also developed a series of semi-automatic, recoil-operated pistols for Fabrique Nationale d'Armes de Guerre (FN) as well as designing the cartridges for them. These were license-produced by Colt. Among these were the Colt .45-caliber M1911 pistol, the standard US sidearm until the mid-1980s.

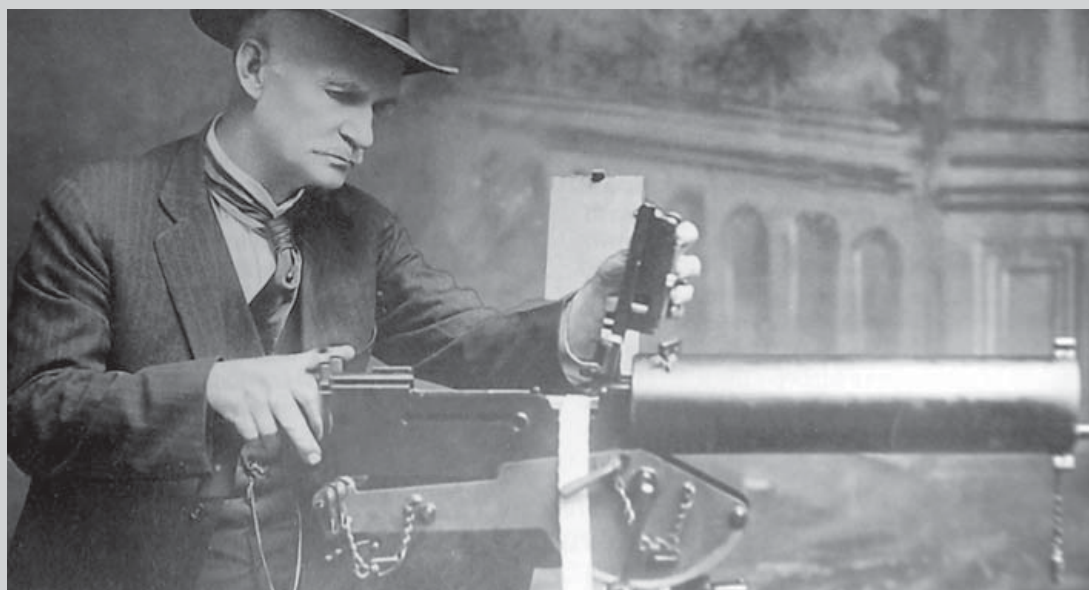
He had a reputation for turning out weapon designs rapidly and with little effort. Redesign and improvements before production runs began were usually minimal. While Browning did

a great deal of work for Winchester, his relationship with the firm can best be described as uncertain, with disagreements over difficulties with the production of a shotgun. He terminated his contracts and did not work with Winchester again until World War I. A more amenable affiliation was maintained with Colt and FN. He began work on his first machine gun in 1890, resulting in a Colt-produced design. During the hectic days of World War I as America attempted to rearm the Army, Browning developed the M1917 .30-caliber machine gun, the M1918 BAR, the .30-caliber tank machine gun, and the .50-caliber machine gun and its cartridge. Additionally, he oversaw the management of five arms plants at the request of the US government.

Between 1921 and 1939 Browning developed an entirely different type of weapon, the Colt-Browning 37mm automatic cannon used as a ground antiaircraft gun and aircraft cannon. In all, John Browning developed almost 40 weapons and seven cartridges. He was granted 32 patents and his commercial success has not been surpassed. Browning has been called "the greatest gun wizard of the modern age" and "the Edison of guns." Among his accolades was the John Scott Legacy Medal presented by the Franklin Institute of Philadelphia in 1905 and the Order of Leopold for meritorious service to Belgium in 1914.

John Browning had married Rachel T. Child in 1879 and they had four boys and four girls. Besides his skill as an engineer, he was an avid outdoorsman with trap-shooting and hiking being his favorite pastimes. John Browning died of heart failure at the FN plant in Liège, Belgium on November 26, 1926 and is buried in Ogden City Cemetery, Utah.

BELOW John M. Browning. (US Navy)



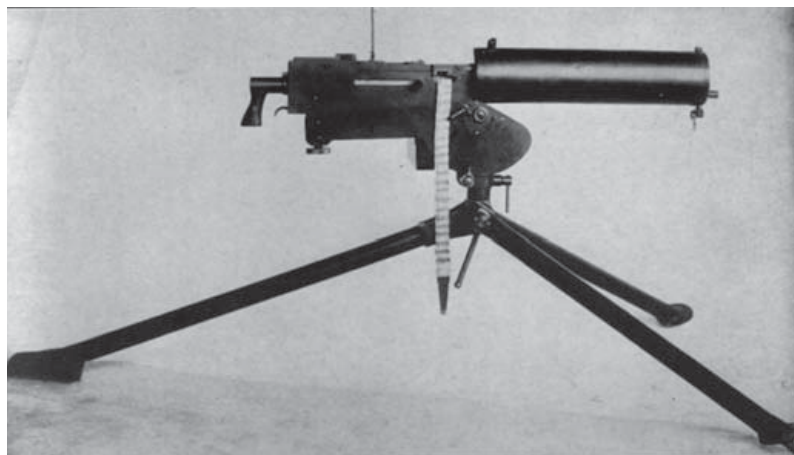
THE M1917

Origins

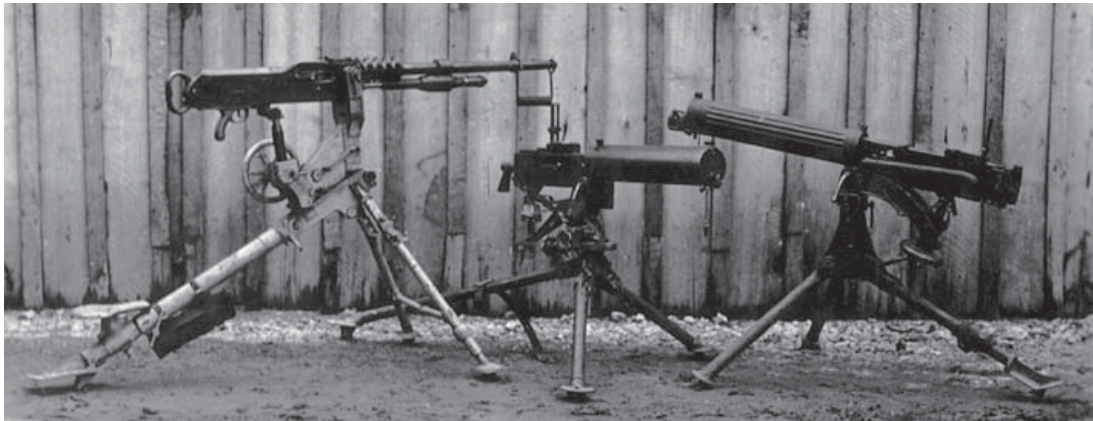
John Browning had mostly designed sporting lever-action repeating rifles and pump-action shotguns, but in 1889 he made a prototype gas-operated rifle. He continued development and built a prototype machine gun, which he offered to Colt Patented Firearms in 1892. The gun was demonstrated to the Navy the next year. Development continued and the Model of 1895 machine gun, the “potato-digger,” was ordered by the Navy in 1896. The Army rejected the weapon as “not suitable for ordinary service and has no place in the land armament.” This was not because of any flaws; they simply could not foresee a tactical need.

Browning saw the value of less complex, more efficient short-recoil-operated machine guns as designed by Maxim. He applied for a patent for such a weapon in 1900 and it was granted in 1901. Browning’s water-cooled Model of 1901 short-recoil-operated gun was significantly different from the Maxim, with a hammer-driven firing mechanism, different trigger and feed lever systems, different belt, and left-side ejection rather than bottom. Holding the shortsighted view that machine guns were unnecessary, the Army did not bother to examine the gun; besides, Browning was not at that time known for the development of military weapons. He and his brother Matthew had signed an agreement giving Colt exclusive manufacturing rights for his machine guns.

Browning continued to perfect his machine gun, resulting in the Model of 1910 with even more simplified design and fewer parts. He minimized the need for any adjustments, maximized its ease of manufacture, disassembly, and maintenance, and designed it to require only minimal operator training. Reducing the number of parts would improve its reliability. It ejected through the bottom, so flying cases reflecting the sun would neither signal its position nor eject hot cases into nearby troops. The belt was fed through the right-side ejection port. Development continued even though there was then no market. With the troubles on the US–Mexican border and the Caribbean, and the probability of America being drawn into Europe’s war, Browning applied for a patent in 1916;



John Browning’s .30-caliber Model of 1910 machine gun, which would become the Model of 1917, as demonstrated to the Army at Springfield Armory, Massachusetts on May 1, 1917. This lightweight prototype tripod was very different than the adopted M1917. (Tom Laemlein/Armor Plate Press)



The principal HMGs used by the United States in World War I (left to right): French-made Hotchkiss 8mm Mle 1914, US Browning .30-caliber Model of 1917, and US-made Vickers .30-caliber Model of 1915 on Mk IV tripod – identical to the British .303 Mk I Vickers gun. (Tom Laemlein/Armor Plate Press)

this gun would evolve into the M1917. At the same time he worked on the gas-operated BAR, actually an LMG. This weapon was desperately needed to replace one of the worst weapons the US Army was ever burdened with, the French-made 8mm Chauchat M1915 LMG.

John Browning undertook the final development of his machine gun and automatic rifle at Colt, which had exclusive rights. The United States declared war on the Central Powers on April 6, 1917. In May 1917, Browning had the opportunity to prove both weapons. A firing demonstration of 12 other weapons, both in the Army's inventory and test weapons, was held at the Springfield Armory, Massachusetts. The Model of 1910 guns were entered as "water-cooled Colt Automatic Machine Guns." The demonstrations were entirely successful. The government immediately made arrangements to purchase the rights to the BAR.

The machine gun, though, was a different matter. Additional tests were called for. These were conducted at Springfield Armory in May 1917. Army officers Browning had trained fired 20,000 rounds from a single gun without a breakage. There were three stoppages owing to faulty ammunition, but firing resumed after recocking the gun. To prove without a doubt that the gun was effective, Browning himself fired another 20,000 rounds through the same gun, with one minor breakage plus several stoppages owing to incorrect loading of the belt. A second gun was fired in repeated bursts for 48 minutes without stoppages. The officers demonstrated the gun's disassembly and reassembly blindfolded, something that simply could not be done with other machine guns with their many small delicate parts.⁴ All of the machine guns in current use had to be accompanied by extensive tool kits, but Browning's could be entirely disassembled using a single pocket-size combination tool and a cartridge. After over a dozen additional tests and technical studies, the weapon was officially adopted as the "Browning Machine Gun, US Caliber .30, Model of 1917"⁵ in May 1917.

4 For example, the manual for the M1909 Benét-Mercié machine rifle directed, "The rifle should not be assembled or disassembled except under the direct supervision of an officer or a competent NCO."

5 Technically, prior to July 1, 1925, weapons were designated, e.g., "Model of 1917." For brevity's sake "M1917" is used throughout this work and could be listed that way in official documents.

Into production

Before mass production could begin, plants had to be built or existing lines expanded. Colt delivered the necessary drawings and gauges to Westinghouse and Remington in July 1917, but tooling up was slow. There was a dispute over the original name selected for the M1917, the "Browning-Colt." Other manufacturers protested and it was directed to be designated as the "Browning." John and Matthew Browning would have been awarded a \$5,000,000 royalty under the existing Colt contract when it was assigned to the US government, but accepted \$1,250,000 as America was enmeshed in a war. John Browning simply stated, "if that suits Uncle Sam, it's all right for me."

There were three manufacturers (with total production figures): New England Westinghouse of Springfield, Massachusetts (30,150 from January 1918); Remington Arms Company of Ilion, New York (12,000 from September 1917); and Colt's Patent Firearms Manufacturing Company of Hartford, Connecticut (600 from June 1918) in their new Meriden, Connecticut plant, built to turn out M1917s and BARs. (The number was small as Colt production still turned out the Vickers M1915 and the new plant had to be built.) Colt could not simply cease Vickers production; it would take months to expand and tool up, as the Vickers was still needed. Westinghouse's production efforts were exceptional; it had turned out its first handmade production example two months after receiving the contract on January 10, 1918, and eventually reached a rate of 500 per day.

Both Browning weapons were publicly demonstrated outside of Washington, DC at Congress Heights in February 1918. Over 300 spectators, including foreign representatives and reporters, were present. Scores of newspaper accounts declared the Browning to be the finest gun in the world. Although 30,089 were shipped to France, only 1,168 would see combat in the last eight weeks of World War I.

Production was hampered by poor heat-treating of some parts, shoddy workmanship from inexperienced toolmakers and machinists, and rushed inspections. It was found that many barrels wore out after about 8,000 rounds; water jackets leaked at both ends; side and bottom receiver plates cracked; the breech lock cam support was poorly designed; and almost 30 other parts were often found defective. These problems did not mean the weapons were unusable, but they required frequent repairs and spare parts were sometimes unavailable. Colt, being the originator of the drawings and gauges, was responsible for determining the causes of problems and finding solutions. It also conducted interchangeability tests between the parts made by different manufacturers. From September 1917 to the war's end, 42,750 guns were produced. Postwar production continued, with a total of 72,500 guns.

A competitive display of M1917s mounted by the 73rd Machine Gun Company, 6th Marines in Tientsin, China, 1928. Competitive inspections were judged by perfection of layout and cleanliness and incorporated all accessories and equipment, including M1923 flash hiders and antiaircraft sights. (Tom Laemlein/Armor Plate Press)



The Browning M1917 and M1917A1

	M1917	M1917A1
Gun weight without water	33lb 8oz	32lb 10oz
Gun weight with water	40lb 12oz	40lb 2oz
Overall length	38½in	38½in
Barrel length	23.9in	23.9in
Rate of fire	400–525rds/min	450–600rds/min
M1917 mount weight	52lb 6oz	
M1918 mount weight	45lb	
Mk IV mount weight	56lb	
M1917A1 mount weight	51lb	

Postwar modifications

The end of the “war to end all wars” did not see the end of M1917 development. The existing flaws had to be worked out and improvements made. Production procedures were improved, metallurgy upgraded, and the design of specific parts refined. Further development extended from the war’s end into the late 1930s. Numerous changes made under a series of Modification Work Orders did not result in a redesignation of the M1917. The rear sight was changed on two occasions to accommodate new ball ammunition.

In the early 1920s, a significant modification was made by adding a reinforcing stirrup under the receiver to relieve the breech lock’s pounding on the breech lock cam. The crack-prone side and bottom receiver plates were strengthened. The new bottom plate had flanges that extended ½in up the side plates and were held in place by seven rivets per side. In the late 1930s it replaced the bottom stirrup and incorporated the trunnion block. A new belt feed lever was able to better feed the belt from a ground-level box rather than only from the closer cradle-mounted box. The tubular M1923 flash hider was adopted. In 1928 a new feed cover latch was designed that held it open to ease inserting a belt. It was fitted to new-production guns, but not added to M1917s that were later converted to M1917A1s (see below). Grips were wood, but in 1932 Bakelite and aluminum grips were tested, with the first to become common on M1917A1s and aluminum to be used on most later M1919s.

The water chest held 1.93 gallons and weighed 8lb empty and 22lb 8oz full. It measured 4½×8×12¾in. The M1 chest had an oval metal carrying handle while the M1A1 had a web strap handle. There was a large round spare-water canteen holding 3 gallons; issued between the wars, it saw little use in World War II.

The M1917A1

Until 1937, modifications to the M1917 had been made under Modification Work Orders on a piecemeal basis and were not necessarily made across the board. In 1936 the specifications for converting the



M1917 to the M1917A1 were outlined. In 1937, M1917 guns and mounts began to be recalled by Rock Island Arsenal, Illinois and all authorized modifications to date made. Funding was provided through the Public Works Administration to pay for thousands of civilian workers.

Even though conversions began in 1937, it was not officially redesignated the M1917A1 until November 1939. There were still 60,000 M1917s in the inventory. Many of the 72,600 M1917s produced had been converted to air-cooled tank, ground, and aircraft guns as well as 1,600 .22-caliber training guns, plus 6,320 unconverted M1917s were sent Lend-Lease to Britain in 1940.

An improved bolt and steam tube assembly was developed during World War II and steel water-jacket end caps and trunnion blocks designed. The steel components were found on new-production guns and the bronze components on existing guns were not replaced unless damaged; the bronze and steel components were interchangeable to accommodate cannibalizing damaged guns.

Between 1942 and 1945, 52,369 M1917A1s along with tripods were built at Rock Island Arsenal. There was a serious shortage of tripods. Guns were also converted at Augusta Arsenal, Georgia; Benicia Arsenal, California; Mount Rainier Ordnance Depot, Washington; Rarital Arsenal, New Jersey; Red River Arsenal, Texas; and Springfield Armory. Conversions and rebuilds continued into August 1945. Virtually no unconverted M1917s exist.

While the M1917A1 was approaching obsolescence by the end of World War II, two new items were developed. The first was a single-point wooden carrying handle similar to that used for the M1919A6 LMG. It was based on the Bren gun's handle and angled to make it easier to carry the heavy gun. It clamped around the rear end of the water jacket. The M74 tripod was adopted in 1951 as a lighter alternative to the M1917A1, but saw scarcely any use.

An M1917A1 being fired in cold conditions, Adak Island, the Aleutians. No condensation hose or water chest has been set up. However, even extremely cold temperatures did not delay overheating to any measureable extent. (Tom Laemlein/Armor Plate Press)

Changing bullets and sights

A machine gun's rear sight must be calibrated for the cartridge's ballistics. The M1917's sight was originally calibrated for the M1906 cartridge's 150-grain bullet. The M1903 Springfield rifle was originally to be chambered for the .30-03 round's 220-grain round-nose bullet. Its heavy recoil was a major complaint and was replaced by the .30-06, with a much lighter spitzer (pointed) bullet. In 1906 no consideration was given to the optimal round for future machine guns. When the M1917 was adopted, its leaf-type rear sight was graduated in meters, as maps were so scaled and the metric system was used by several Allied armies. The sight was not changed to one graduated in yards until 1922. British, French, and German machine guns used heavier bullets than the .30-caliber M1906 and achieved longer ranges, essential for effective fire support. When some US units finally received M1917s, it came as a surprise that they lacked the effective range of their counterparts owing to the much lighter bullet. Test firing showed the existing firing tables quoted theoretical accuracy and ranges, and were far from realistic.

After World War I a new .30-06 ball round was developed with a heavier bullet, the 173-grain boat tail M1 ball. The bullet's design was copied from the virtually identical Swiss 7.5×55mm GP11 ball round. The M1906 ball had a maximum range of 3,450yd. The M1 ball's maximum range was 5,500yd. The new round was adopted in 1925, but was not issued until 1936, as the existing 2 billion M1906 rounds had to be expended. In 1925 the M1917's buffer was redesigned to absorb 15 percent more recoil in anticipation of the new round, but the new M1 graduated sight was not changed until 1932.

With the issue of the new ammunition, which had been produced and placed in war-reserve stocks, two surprises arose. The first problem emerged from complaints of excessive recoil with bolt-action Springfield rifles, the same complaint experienced with the original 220-grain .30-03 round. The second was the discovery that machine-gun and rifle ranges had been constructed with limited safety fans (an impact area extending beyond the targets for the distance of the bullets' maximum range) for the shorter-ranged M1906 ball. The M1 ball exceeded this by over 2,000yd. This was even more restricted on National Guard ranges, which were often near urban areas. The National Guard Bureau requested that 10 million rounds of the M1906 or similar ammunition be produced for their use, and development was undertaken, being completed in 1938.

This new 152-grain round, just slightly different than the M1906 with a higher velocity and longer range achieved by an improved propellant, was standardized in January 1940 as the M2 ball with the same range as the M1906. A new rear sight was fitted in 1941 that was graduated for both the M1 and M2 rounds. During this same timeframe the Garand M1 rifle was undergoing extensive testing, and with the adoption of the lighter M2 bullet the rumor spread that it was standardized because the M1 rifle was unable to handle the recoil of old M1 ball ammunition, which is untrue. The M2 ball was adopted to accommodate existing firing-range safety-fan restrictions, provide a lighter, less recoil-prone round, and still achieve a higher velocity for longer range. The land was simply not available to expand the range safety fans on most posts without sacrificing equally limited maneuver training areas or endangering off-post civilian property.

THE M1919

Origins

The need for a lightweight, man-portable machine gun was recognized early in World War I. The British and Belgians used the Lewis gun (27lb), the Germans the MG 08/15 "lightened" Maxim (31lb), and the French and the Americans the Chauchat M1915 (20lb). Few M1918 BARs (16lb) saw action in the war's closing weeks. These weapons armed squads or platoons. The United States would retain the BAR as a squad weapon, but desired a lightweight tripod-mounted machine gun as a company-level weapon for direct-fire support. It was unnecessary for the lighter gun to deliver long-range and indirect fire, permitting a much lighter tripod. The need for an air-cooled gun was obvious, owing to increasingly mobile warfare and fire-and-maneuver tactics. Water-cooled guns required a heavy tripod and water jacket, water chest, condenser hose, and the water

itself with sufficient available for a refill, which totaled almost 4 gallons – 8.3lb per gallon – about the weight of the gun itself. Steam from the condenser could reveal the gun's position depending on air temperature and humidity. At below-freezing temperatures, ethylene glycol antifreeze had to be added to the water and could protect it down to –62 degrees Fahrenheit.

The M1919A2

Work on air-cooled Brownings had already begun in the form of tank guns. The first LMG effort was initiated by the cavalry in late 1930, using modified M1919 tank guns. The M1917 was difficult to pack-transport and it was planned to add a pack-transported machine gun troop to the cavalry regiment. The only automatic weapon available to the cavalry was the .30-caliber M1922 machine rifle, a lightened BAR. It was ineffective for long-range and suppressive fire. The effort was undertaken by the 1st Cavalry Division at Fort Bliss, Texas, bypassing the Ordnance Department. The gun was initially known as the M1919A1, but in 1931 the M1919A1 tank gun emerged, so the cavalry weapon became the M1919A2.

The initial gun had the tank gun's 18.62in barrel, a tubular butt stock, leaf rear sight, and a front sight clamped behind the muzzle giving it a longer sight radius than other M1919-series ground guns, and was mounted on the Mk I emergency tripod. It had the same bolt latch as the M1919A1 tank guns to lock the bolt in the open position for better cooling. A leather carrying sling was provided; also with the M1919A3. The gun could easily be carried on a mule's backpack with the folded tripod attached. Several types of sights and tripods were tested. The cavalry-designed tripod was standardized in 1933 as the M2 and soon replaced the Mk I.

The M1919A2 was standardized in 1931 and was not only a mule-packed gun, but armed cavalry scout cars, armored cars, halftracks, and jeeps. It was widely issued by the mid-1930s. The major complaint was its poor range, owing to the short barrel. It remained in limited use within the 1st Cavalry Division through World War II alongside the M1919A4. The division was dismounted in 1943 and fought as infantry in the Southwest Pacific.



An M1919A2 mounted on a T1E2 personnel-carrier halftrack. Its short (18.62in) barrel is readily apparent here. This reduced its range, accuracy, and penetration. (Tom Laemlein/Armor Plate Press)

A dash-mounted M1919A2 is mounted on a light field car. Another M1919A2 is mounted in the rear, mainly for anti-aircraft use, for which the dash-mounted gun could also be employed. (Tom Laemlein/Armor Plate Press)



The “M1919A3”

The infantry, too, had a need for an LMG at company level. There was a broad gap between BAR-armed rifle squads and the eight heavy M1917s found in battalion machine-gun companies. In 1931 the chief of infantry requested 72 M1919 tank machine guns modified along the lines of the M1919A2 with the same Mk I tripod, but lacking the shoulder butt and with crude makeshift sights. This was designated the M1919E1, but was more commonly known as the “M1919A3.” The concept of adding two LMGs to each rifle platoon, to give the regiment a total of 54 LMGs, was tested. This added 16 men per platoon, however – 432 per regiment – which funding and manpower restrictions could not support.

The problems with the 18.62in barrel on the M1919A2 and M1919A3 were soon apparent. It caused reduced velocity, resulting in shorter range, loss of accuracy, reduced penetration, and excessive muzzle flash and blast. An LMG needed to be able to match the rifle’s range. The cavalry used them on vehicles for ground targets and anti-aircraft defense, and also needed longer range. In the anti-aircraft role the .30-caliber proved to be ineffective against aircraft above 2,400–3,000ft.

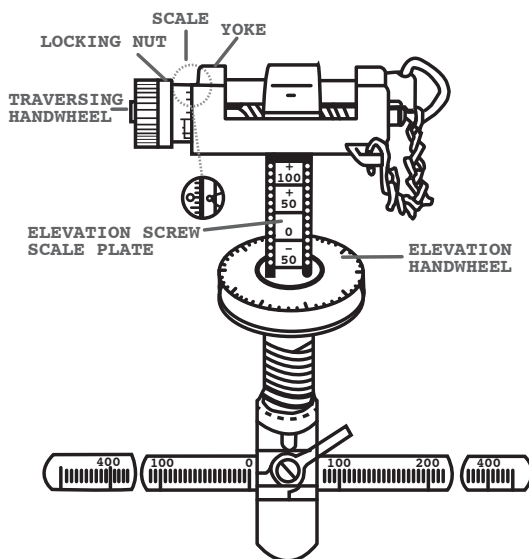
The M1919A4 (flexible)

Rock Island Arsenal took over machine-gun development from Springfield in 1936. A developmental gun designated the M1919A2E3 with a 24in barrel was tested by the Infantry and Cavalry Boards and the longer barrel found effective. It was designated the “Browning Machine Gun Cal. .30 M1919A4” on September 5, 1935. Both flexible (Ordnance Major Item 51-84) and fixed (51-83) versions were approved. Initially it was additionally designated “heavy barrel” (HB), but this was dropped in about 1941. From 1939 the cavalry’s M1919A2s were to be converted to M1919A4s, but some were not. Even with the adoption of the M1919A4 and continued improvements, the Ordnance Department conducted an

LMG test in late 1941 in hopes of finding a better weapon. Six civilian manufacturers and government arsenals submitted guns for comparison against weapons in the Army’s inventory. None of the guns met even minimum standards.

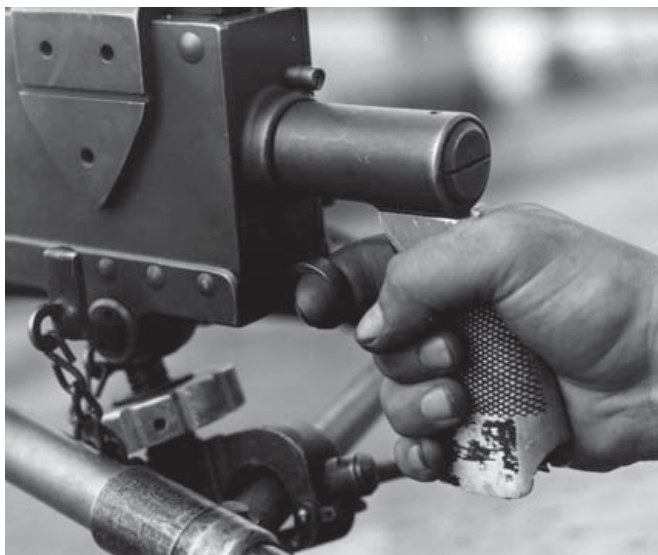
Issue of the M1919A4 was initially slow. Production skyrocketed after America plunged into World War II. Only small numbers were assigned to infantry units, though – two per rifle company – while large numbers were used on tanks and other AFVs. The M1919A4 would be the most-produced version of any of the Browning “thirties.” Approximately 397,000 M1919A4 flexible guns and 50,000 fixed M1919A4 and M1919A5 guns were produced by the Saginaw Steering Gear Division of General Motors

The T&E device used with the M1919A4 and M1919A6 on the M2 tripod. The upper end is attached by a pin to the rear underside of the receiver and the lower end latched to the traverse bar between the tripod’s rear legs. (Tom Laemlein/Armor Plate Press)



Corporation in Saginaw, Michigan, Buffalo Arms Corporation of Buffalo, New York, and Rock Island Arsenal, Illinois. Additionally, some were converted from M1917s. Buffalo Arms, which relied heavily on subcontractors for even major parts, produced 38,000 M1919A4s between March 1942 and July 1943. Saginaw had to build a new plant first; the firm began production in March 1941, seven months ahead of schedule, and was the major producer of M1919A4, M1919A5, and M1919A6 guns, turning out almost 420,000. Rock Island turned out its first gun in April 1940 at a slow rate; it produced almost 30,000 by the war's end. In March 1943 the Ordnance Department, for the sake of efficiency, directed that Saginaw continue to produce M1919-series guns, Rock Island making only M1917A1s, while Buffalo Arms would run off only .50-caliber guns. Buffalo continued to produce M1919A4s until July 1943. This plan increased production rates and made it easier to institute modifications on the production line as specifications were changed. These producers also made a set number of spare parts per 100 guns. For every machine gun made there were four spare barrels.

The M1919A4, while an effective, rugged, and reliable weapon, was found to be less than ideal as an infantry LMG. The search for an effective bipod-mounted LMG continued throughout World War II. Few guns met the requirements and the few promising guns would take too long to perfect, set up for production, and manufacture before World War II ended.



The aluminum handgrip on the M1919A4. Note the groove in the bottom of the grip. It contained a spring steel clip for when the T&E mechanism – seen to the left of the handgrip – was unlatched from the tripod's traverse bar and swung up and clipped to the grip, for ease of carriage when the gun was dismounted from the tripod. (Tom Laemlein/Armor Plate Press)

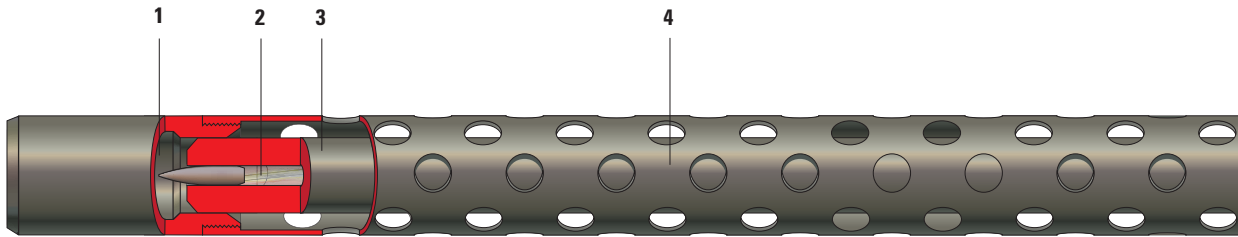
The M1919A6

Before the Ordnance Department's 1941 inconclusive LMG tests had been concluded, the Infantry Board began work on a bipod-mounted version of the M1919A4. It included a makeshift bipod, shoulder stock, and carrying handle. It was originally envisioned for paratroopers, but with US forces' exposure to the German guns, it was recognized that all infantry units needed such a weapon. Development and testing was continued sporadically through 1942 with many variations of modified M1919A4s, especially barrels and muzzle boosters. Muzzle-booster design was important owing to the necessity of using a lighter barrel. The booster increased the recoil strength to ensure there was sufficient reserve power to reliably operate the gun.

What was to become the M1919A6 had a lighter, thinner barrel – at 4lb 10oz, 2lb 11oz lighter than the A4's – an improved muzzle booster, a removable 1.75lb stamped-metal shoulder stock, a bipod with telescoping legs based on the BAR's, and a two-point plastic carrying handle. At this

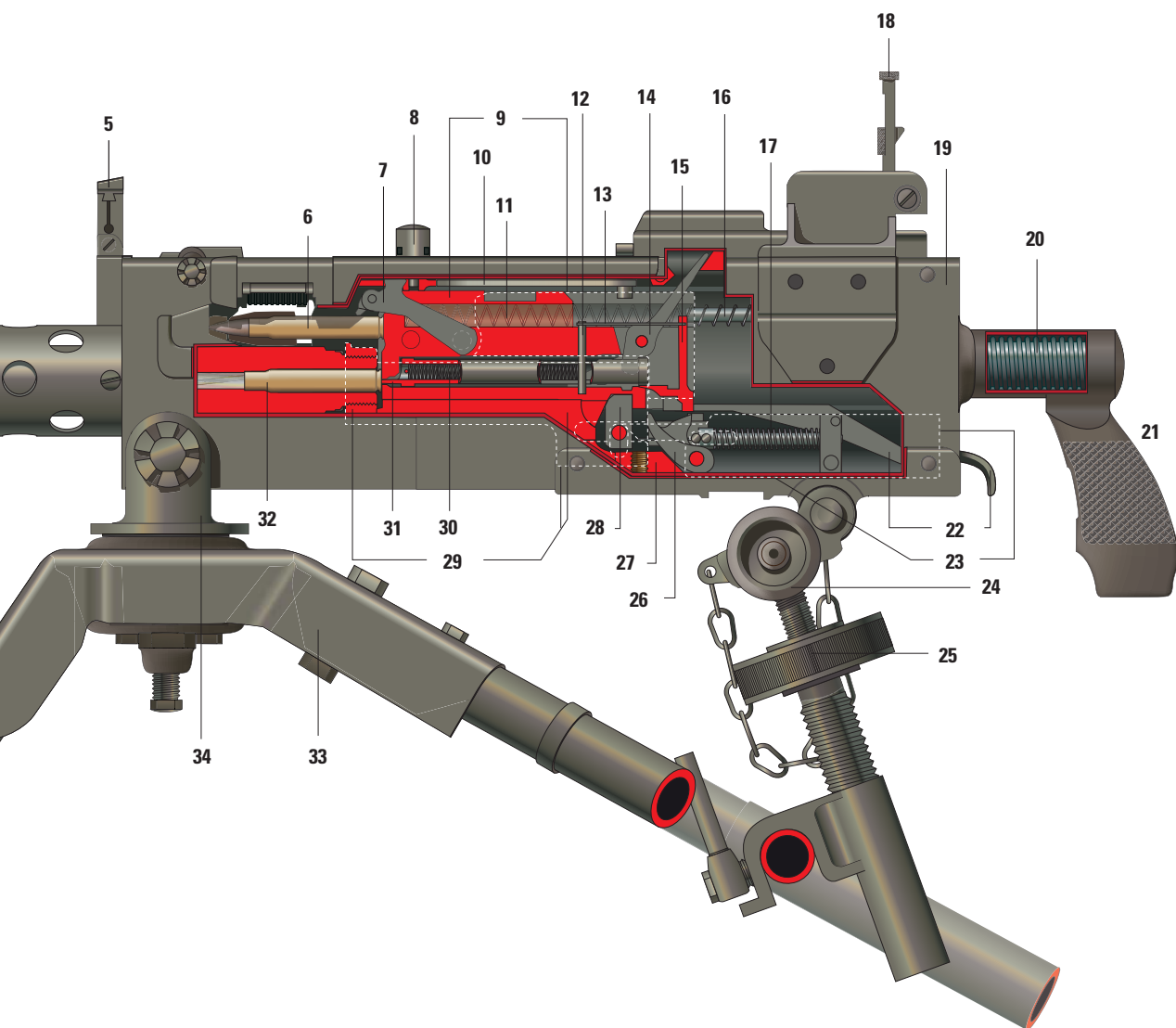
THE .30 CAL EXPOSED

.30-caliber Browning M1919A4



- | | |
|-------------------------------|--------------------------------------|
| 1. Muzzle booster | 18. Rear sight |
| 2. Rifled bore | 19. Receiver body |
| 3. Barrel | 20. Buffer spring |
| 4. Perforated barrel jacket | 21. Pistol grip |
| 5. Front sight | 22. Trigger |
| 6. Cartridge in belt | 23. Lock frame |
| 7. Extractor assembly | 24. Traverse and elevating mechanism |
| 8. Latch knob | 25. Elevating handwheel |
| 9. Bolt assembly | 26. Accelerator |
| 10. Lever belt feed | 27. Breech lock cam |
| 11. Driving spring | 28. Breech lock |
| 12. Sear spring pin | 29. Barrel extension |
| 13. Sear spring | 30. Firing pin spring |
| 14. Cocking lever | 31. Firing pin |
| 15. Sear | 32. Cartridge in chamber |
| 16. Driving spring rod | 33. M2 tripod |
| 17. Barrel plunger and spring | 34. Mounting pintle |





Intended for infantry on the M2 tripod and cavalry on vehicles, the M1919A4 had a 24in heavy barrel weighing 7lb 5oz – much heavier than the M1917A1's – which slightly reduced the firing rate to allow single shots to be fired easily. The longer barrel provided a flatter trajectory, increased range, and improved accuracy and penetration, plus reduced muzzle flash. The heavier barrel withstood rapid heating and it had an improved leaf-type rear sight and a folding blade sight on the front of the receiver. This reduced the sight radius to 14in from the 23in found on the M1919A2 with its near-muzzle front sight, but lessened chances for breakage and snagging on vegetation.

Early-production guns had slotted barrel jackets, but most were made with 90 circular vent holes. This not only made the jackets

stronger, but reduced costs, as milling slots was more costly than drilling holes. Other improvements were made between its 1935 adoption and 1940 low-rate series production. These included parts design refinement, changes in materials, and modifying manufacturing techniques; such changes were made throughout its production run. The earlier-introduced aluminum handgrip replaced the wooden grip, and an improved feed-cover latch, modified belt-feed lever, addition of a handle to the cover latch, and other refinements were introduced.

Various lighter-weight barrels were tested, but the heavy barrel was retained. The firing rate was increased with a new driving spring, but it was decided this exceeded the weapons design capabilities and would result in increased breakages and stoppages.



An M1919A6 in Korea, 25th Infantry Division, 1951. Most by now had cone-shaped M7 flash hiders fitted (removed here). The bipod legs are lowered, which helped radiate heat. OD web ammunition belts were now in wide use. (Tom Laemlein/Armor Plate Press)

time it lacked a flash hider. It could still be mounted on the M2 tripod, and they continued to be issued with the M1919A6. With the additions, though, the M1919A6 was slightly heavier than the M1919A4 and about the same weight as the M1917A1 without water.

The Infantry Board was far from satisfied, but there was nothing

else available or even on the horizon so it was decided to adopt it as “limited standard,” that is, to be issued only to selected units. This occurred on April 10, 1943. The M1919A4 was still standard and armed most units. Mainly airborne units, plus the Japanese–American 442nd Infantry Regimental Combat Team and some divisions in Europe, received the M1919A6 in late 1944. The M1919A6s had to be modified from M1919A4s and strenuous testing was undertaken. It was decided to make no further modifications to the M1919A6 unless absolutely essential. It was very much considered an interim weapon and the search went on for a better LMG. This did not come to fruition for another 14 years with the M60.

The M1919A6’s carrying handle was influenced by what was known as the “Basilone handle” or “bail handle.” It was a wooden dowel 6in or so long, sometimes with tapered ends to provide a better grip. Grooves might have been cut around the ends to secure the heavy wire fasteners that were threaded or hooked through barrel-jacket vent holes just forward of the receiver.

More M1919A4s were converted to M1919A6s after World War II and the weapon saw service in Korea alongside the M1919A4. In all, 34,000 were converted to M1919A6s. At the end of the Korean War, Rock Island Arsenal produced purpose-built M1919A6s along with some M1919A4E1 tank guns while the M37 was awaiting production. Saco-Lowell Shops of Biddeford, Maine produced more M1919A6s after the war. It still by no means fully replaced the M1919A4. The Marines never used the M1919A6.

Two improvements were made, though: the M7 (T25) cone-shaped flash hider, which doubled as a muzzle booster, and a one-point carrying handle. This new wooden handle was based on the Bren gun’s; it was more firmly fixed to the barrel jacket, and, being angled, made the weapon more comfortable to carry. The M1919A6 armed most infantry units after the war and into the early 1960s. Many National Guard and Reserve units used the M1919A6 into the 1970s. Even though the M60 GPMG was adopted in 1957, it was not issued until 1959 and there were units armed with the M1919A4 and M1919A6 on the eve of the Vietnam War.



The Mk 21 Mod 0 was a 7.62mm derivative of the venerable M1919A4, used to arm riverine craft in Vietnam. Note the futuristic-looking flash hider. The shield mounting brackets can be seen forward of the belt. (US Navy)

With the adoption of the .30-caliber T65E3 cartridge as the 7.62mm NATO in 1954⁶ to replace the .30-06, between 1949 and 1956, some Brownings were chambered for the new round for testing. These included the T66 (M1919A4), T66E1 (M1919A6), and T214 (M1917A1). The 7.62mm M60 (T161E2) GPMG and the non-Browning M73 (T197E2) tank gun were adopted in 1957 and 1959 as the new machine guns.

The Mk 21 Mod 0

The final US version of the M1919A4 was used by the Navy in Vietnam. The Mk 21 Mod 0 was an M1919A4 modified at Naval Ordnance Station, Louisville, Kentucky in 1967. The Navy possessed large quantities of M1919A4s. While it had been technically replaced by the 7.62mm M60, the Navy had a requirement for 7.62mm guns to arm riverine craft in Vietnam. Weight was not an issue and modifying the guns would cost less than purchasing M60s. A new 7.62mm barrel fitted with a 6in-long prong-type flash suppressor replaced the original. Modifications were made to the bolt and feed cover to accept 7.62mm ammunition in metallic-linked belts, and a second belt holding pawl and feedway spacer block added to accept the shorter cartridges. It used the same disintegrating metallic-linked belt as the M60. The original .30-caliber M1 links and the 7.62mm M13 links were very different and rounds were extracted differently for chambering. This problem was resolved by feeding the M13 metallic-linked belt into the Mk 21 from the opposite end (as it was fed into the M60), the double-loop end instead of the usual single-loop end. This posed no problem because M60 belts were packed in bandoleers with both ends of the belt exposed so the 100-round sections could be connected to the next belt. The ammunition, one M62 tracer and four M80 ball, was packed with two 100-round belts in a pair of bandoleers in an M19A1 metal ammunition box. The Mk 21 was fitted to pedestal mounts with a small shield on armored troop carriers (much-modified landing craft, mechanized) and other riverine craft. It weighed 33lb, measured 41in long (47in with suppressor), and had a cyclic rate of 600–650rds/min. M60s eventually replaced some Mk 21s.

⁶ The 7.62×51mm round was standardized for NATO in 1954, but the United States did not adopt the M14 rifle and M60 machine gun until 1957 and M73 tank gun until 1959.



SHUMATE
2013





Marine tankers take a smoke break aboard their Marmon-Harrington CTL-3 light tank of the 1st Tank Company, 1st Marine Brigade. This prewar "tank" was plagued with problems and was far too lightly armored and armed to be effective. Its armament of three M1919A4s can be seen in this photograph. (Tom Laemlein/Armor Plate Press)

BROWNING TANK MACHINE GUNS

When the tank was introduced into No Man's Land in September 1916, it was essentially a machine-gun carrier designed to crush through barbed wire and knock out machine-gun nets. On World War II tanks standard flexible machine guns were used in bow, sponson (side mountings), and turret-top anti-aircraft mounts. This sometimes required special mounting adapters, and often the normal sights were removed. Machine guns purely designed as fixed tank guns are those mounted as coaxial guns.

These were machine guns mounted on the right side of the main gun to fire through a port in the mantle (a heavily armored gun shield that can be elevated). The main gun's combination mount also served as a mount for the fixed machine gun. Owing to the cramped space, the normal cocking handle on the right side was inaccessible. An extended retracting handle protruding beyond the gun's rear was provided to cock and clear the gun. On some, the feed-cover latch was made more accessible. The gun

Early combat with the M1919A6 (previous pages)

The 442nd Infantry Regimental Combat Team was the most decorated unit in the US Army during World War II and one of the first to receive the new M1919A6 in the fall of 1944, along with the parachute regiments. The early-issue M1919A6s were fitted with a two-point carrying handle, bipod, and shoulder stock. They lacked the more robust single-point carrying handle, cone-shaped flash hider, and tripod pintle added later. The M1919A6 was actually 1½lb heavier than the M1919A4. The latter remained in use in some units alongside the M1919A6. They were not always replaced one-for-one, but M1919A6s were issued to replace M1919A4s as they were lost or damaged.

Here, troops armed with an M1919A6 withdraw from combat outpost positions, passing troops on the main line of resistance with an M2 tripod-mounted M1919A4. The M1919A6 could be mounted on the same tripod. The M1919A6 gunner carries an ammunition-carrying bag (often misidentified as an "M1 ammunition bag"). The 250-round web ammunition belts are held in M1 ammunition cans. OD belts had only recently arrived on the battlefield to replace white belts. Rather than 5-in-1 ball- and tracer-loaded belts, 5-in-1 AP and tracer belts were used to penetrate better through trees and masonry buildings. A machine-gun and ammunition-carrying sling lies on the ground; two were issued per LMG, along with an M13 spare parts roll. The squared hooks accommodated ammunition-can carrying handles. Ammunition belts and cans were meant to be turned in, but more often were simply abandoned on the battlefield and later gathered by quartermaster salvage-collecting companies and ordnance evacuation companies from the army corps.



This is a Browning M1919 tank machine gun, modified in 1931 as the M1919E1 and more commonly known as the "M1919A3" for testing as an infantry LMG. While never standardized, it led to the M1919A4. It is mounted on an Mk I emergency tripod, which was usually used initially with the cavalry's M1919A2. The experimental 80-round ammunition boxes were designed to be discarded. (Tom Laemlein/Armor Plate Press)

was aligned with the main gun's bore, elevated and traversed in unison with it, and used the same optical sight. It could not be trained separately from the main gun. The flexible bow gun was freely aimed across the tank's frontal arc. All US tanks and the M8 armored car mounted coaxial machine guns. Tank destroyers lacked both coaxial and bow machine guns. These guns were not only for self-defense, but were valuable offensive weapons to neutralize enemy positions, provide suppressive fire, and reconnoiter by fire.

The M1919 and M1919A1

The first Browning tank guns were M1917s converted to air-cooled operation, with John Browning beginning work in the fall of 1918. (At the war's end the standard tank guns were modified Marlin M1917 aircraft guns.) This gun had a short, very heavy 18in barrel; only a short barrel was needed, as engagement ranges were expected to be less than 600yd. The jacket had six rows with 12 slots. It had a small tubular rear sight, an external bolt latch, a 12in flat bar on the right side to hold the bolt open between pauses in firing to prevent cook-offs, and a cylindrical secondary grip with an auxiliary trigger on the receiver's rear underside. A small Mk I emergency tripod and a detachable tubular shoulder butt were supplied for off-vehicle use. Owing to the lack of space, 100-round metal ammunition boxes were used. Another accessory was a canvas bag to catch 500 empty cases. When mounted in a tank, it was held in a 7½in-diameter steel ball mount with a 3½in-diameter, ½in-thick armored tube with vent holes through the top and bottom. This tube extended 15½in beyond the ball and several inches beyond the gun's muzzle. A slot pierced the ball for sighting.

The gun was rushed through approval and adopted on September 30, 1917 as the "Browning Machine Gun US Cal. .30 Model of 1919."

A tank commander mans an M1919A4 atop an M5A1 Stuart light tank. The gunner would often operate the gun from outside the turret to provide him freedom of movement and a wider arc of fire than if confined within the turret hatch. The domed object below the gun is a searchlight that has been turned lens downward. (Tom Laemlein/
Armor Plate Press)



Westinghouse turned out 1,806 guns before the contract was cancelled. The war ended one week before they were to be shipped. A later version had a telescopic sight that was longer than the barrel.

In 1931 it was pointed out the guns with armored barrel tubes and telescopic sights were also designated M1919. The model with the telescope was briefly redesignated the M1919E1 and then the M1919A1. At the same time the cavalry was testing a light ground gun, which it designated the M1919A1. To confuse matters further, it was modified from an M1919 tank machine gun, but both guns – M1919A1 tank and M1919A1 cavalry – were marked “Browning Machine Gun, Cal. .30 M1919.” It was decided to redesignate the cavalry M1919A1 as the M1919A2.

The M1919A4 (fixed) and M1919A5

The next tank gun was the M1919A4 (fixed), approved on September 5, 1935 along with the M1919A4 (flexible) ground gun. The fixed gun differed from the ground gun in having a modified back plate and vertical buffer, and lacking a hand grip. M1919A4 fixed guns were issued with sights. The fixed M1919A4 was mainly used as a coaxial gun on M3, M3A1, and M3A3 (there was no M3A2) and M5 and M5A1 Stuart light tanks, and M4-series Sherman medium tanks. It was also mounted in the M3-series Grant medium tanks’ cupola atop the 37mm gun turret. However, the gun had to be modified to fit the different combination mounts – main gun and coaxial gun. The feed-cover detent was normally on the right side, but was moved to the left. The main modification was a retracting handle, an arm curved on the end that extended beyond the rear plate to allow the gun to be cocked and cleared. Most combination gun mounts prevented the normal cocking handle on the receiver’s right side from being used. This modified M1919A4 (fixed) gun was redesignated the M1919A5 in January 1942 (Major Item 51-114).

M1919A4 (fixed) and M1919A5 guns were provided with either a vertical buffer or, more commonly, a horizontal buffer only one-third the length of a flexible gun’s buffer with handgrip. The M1919A5 lacked

sights. As the M3-series light and M3-series medium tanks were removed from service, most of the M1919A5 guns were converted to M1919A4 and M1919A6 guns. Most new tank coaxial mountings could now accept flexible M1919A4 guns.

The M1919A4E1

New tanks were being developed and fielded in the late 1940s and early 1950s, namely the M41 Walker Bulldog light and M26, M46, and M47 Pershing medium tanks, meaning a new coaxial gun was necessary. M1919A4E1 development from the basic M1919A4 began in late 1950. It had a straight retracting arm, an improved feed cover and back plate, and a trigger lock. The most noticeable differences were that it could be configured for either left- or right-hand feed and it retained a pistol grip and sights. Changing the side it was fed from could be accomplished in the field merely by switching and reversing internal parts. This allowed the gun to be used dismounted, addressing a common complaint about the M1919A5; an M2 tripod was carried aboard tanks for this purpose. In 1954–55, 18,185 M1919A4s were converted to M1919A4E1s.

The M37

The M1919A4E1 was an interim weapon and work soon began on its replacement. The T151 and T152 were developed by High Standard Manufacturing Company of Hamden, Connecticut, converted from M1919A4s. These guns did not meet requirements, so the Bellmore-Johnson Tool Company, which had worked with High Standard, developed the T153 with an improved feed paw, redesigned feed cover and latches allowing opening from either side, curved retracting handle, and link-ejection chute. The gun could be reversed for left- and right-hand feed. The internal driving spring was of the “captive” type, that is, it could not spring free to injure a soldier when it was being disassembled. It could be used on the M2 tripod. Adopted in 1955, the M37 was considered the best of the Browning designs and was used as a coaxial gun in the M48-series Patton and M60-series main battle tanks well into the 1960s. They were produced by the Saco-Lowell Shops of Biddeford, Maine and Rock Island Arsenal from 1955 to 1957. An interim gun was the M37E1 with an under-buffer much-redesigned handgrip, solenoid triggering system, redesigned feed cover, and other refinements – including not requiring headspace adjustment. The main difference was that it was chambered for the 7.62mm



A Marine M2A4 light tank in the Upper Solomons with twin M1919A4s jury-rigged on the turret. The turret-top .30-caliber on light tanks was intended for antiaircraft defense, but in this case it was used for antipersonnel and suppressive fire in the dense jungle. (Tom Laemlein/Armor Plate Press)

NATO cartridge, at that time known as the .30-caliber T65E3. It was developed by the Bellmore-Johnson Tool Company using converted M37s. This last Browning tank gun was replaced by the 1959 7.62mm M73 machine gun, a non-Browning design and ultimately a failure.

BROWNING AIRCRAFT MACHINE GUNS

Origins

The United States ended World War I with a variety of aircraft machine guns, including the Colt-made Vickers M1918, Lewis M1917 and M1918, and Marlin M1917 and M1918. The Marlins were developed from the Colt-Browning M1895, having been converted from a gas-actuated lever to a gas-actuated piston. This eliminated the articulated lever that thrust below the gun's barrel when fired. It became the standard aircraft gun after the war. All were .30-caliber, but the Vickers was also available in 11mm. The fledgling US Army Air Service employed British and French aircraft, but all were armed with British-made machine guns. Few American-made guns arming aircraft saw combat.

With the adoption of the Browning M1917 ground gun, it was decided to pursue development of an equivalent aircraft gun to replace the existing hodgepodge of aerial weapons. While the Browning short-recoil system was to be used, it was deemed unnecessary for all the ground and aircraft guns' parts to be interchangeable. They could be lightened or strengthened, as the case might be, to reduce weight or consequently to withstand the stress of a higher firing rate. Any aerial guns had to be able to be coupled to the Nelson Synchronizer.

Weight was a serious concern for 1920s and 1930s aircraft: there was even resistance to .50-caliber machine guns owing to gun and ammunition weight, and more .30-caliber ammunition could be carried as opposed to .50-caliber, regardless of whether more robustly built and armored aircraft were appearing – 100 rounds of .50-caliber weighed the same as 400 of .30-caliber. Proponents of .30-caliber claimed that the lighter gun's ability to penetrate another aircraft with more holes made it a more effective weapon. In reality, there is no comparison between the damage a .30-caliber 152-grain bullet and a .50-caliber 711-grain bullet could inflict. While the various Browning aircraft guns appeared similar to the M1919, they were different weapons, being lighter and sharing few common parts.

A rate of fire of more than 1,000rds/min was necessary. This was achieved by using a lighter bolt, a muzzle booster to entrap gas and increasing the barrel's recoil force, a stronger recoil spring to return the bolt faster, modified recoil buffer, and use of a metallic-linked belt as rounds were extracted faster.

The M1918 and M1918M1

The first Browning airborne gun effort resulted in a less-than-acceptable weapon. The M1918 fixed aircraft gun was developed from the M1917

HMG. The water jacket was removed and replaced by a slotted protective sleeve. The pistol grip and sights were removed, a retracting handle fitted for cocking, a solenoid cable trigger system with a trigger motor added, and parts lightened and strengthened as necessary. In 1920 the Aircraft Armament Board reported that the many piecemeal-redesigned parts negated the function of others, owing to poor mechanical interaction. Many modifications were minor, but others were so costly that some suggested it would be more practical to design a new gun. Another flaw was that it could not be adapted from left- to right-hand feed. This was necessary in cowling and wing mountings.

The board recommended a significant number of changes. The M1918 gun was never standardized, but some were mounted on aircraft for unit testing. Most of the 5,078 Westinghouse- and Marlin-Rockwell-made guns were placed in storage. The majority of the M1918s were modified to the M1918M1 with an improved firing mechanism in the mid-1920s, along with many minor modifications, but most of the remaining 3,000 guns still remained in storage. Many were rebuilt as M1917A1 HMGs with the beginning of World War II.

Browning M1918M1, AN-M2, and Mk II (.303in) aircraft machine guns

	M1918M1	AN-M2	Mk II (British)
Gun weight	23lb 8oz	21lb 8oz (fixed); 23lb (flexible)	21lb 14oz
Overall length	37.25in	39.8in	44.5in (with flash hider)
Barrel length	23.9in	23.9in	23.9in
Rate of fire	1,000rds/min	1,000–1,350rds/min	1,150rds/min

The M1919

An M1919 fixed aircraft gun was tested, being converted from M1918M1s. It was a very different weapon than the M1919 ground guns. The Aircraft Armament Board had not yet released its report when development of the M1919 began. As this work continued, the one-off M1921 (fixed) and M1922 (flexible) aircraft guns were built at Springfield Armory and tested at Wright Field, Ohio. Many of the components were lightened and they could be easily converted in the field from left- to right-hand feed. There was a great deal of conflict as to what was wanted between different aerial armaments factions.

Some of the M1921/1922's features were incorporated into the M1919 fixed gun, basically a product-improved M1918M1. Major differences were the forward mounting bracket, receiver bottom plate, and a vertical buffer on the back plate. It could be switched from left- to right-feed. Testing was conducted between 1921 and 1924, and it was officially adopted as "Browning Aircraft Machine Gun, US Cal. .30 Model of 1919" on April 27, 1924. Marlin M1917 and Browning M1918M1 aircraft guns continued in use. These guns had 27 ventilating slots in six rows. Colt produced 925 M1919s. It is thought that so few were produced because Colt was working on a further improved aircraft gun.



A .30-caliber AN-M2 was mounted in the side blister position on a Navy Consolidated PBX Catalina flying boat. The bulging blister allowed for unrestricted observation and remained closed with the gun swiveled inside. When needed, the blister was rolled upward and the gun pivoted outboard for a wide field of fire. (NARA)

The AN-M2

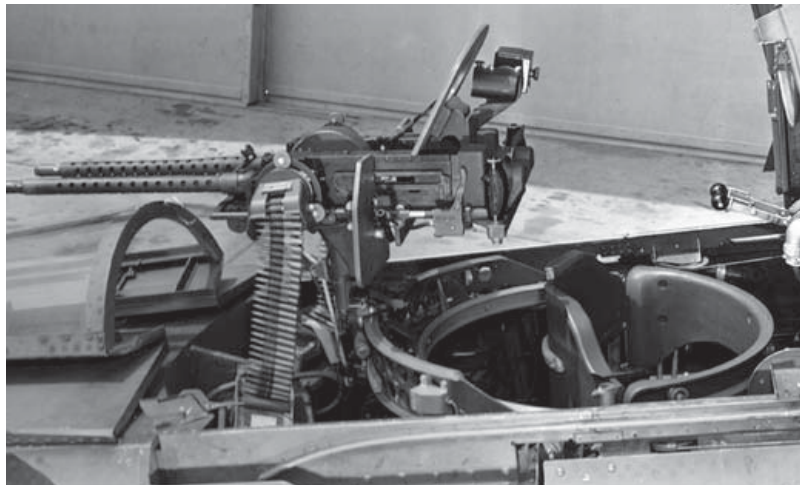
Colt introduced the T2 aircraft gun in 1927 in fixed and flexible variants, essentially a new weapon. Components were lightened, metal was removed from other parts for weight reduction, and a thinner barrel was provided. The receiver walls were thinner, making it about an inch narrower than other Browning receivers. The barrel jacket had round perforations rather than slots – 52 holes in four rows. The holes provided slightly more weight reduction than the previous slots, plus they made the jacket stronger. The lightened components helped raise the rate of fire. The T2 was one-third lighter than the M1919A4 ground gun.

Extensive testing was conducting at Springfield Armory, Aberdeen Proving Ground, and Wright Field. It was adopted in early 1929 as the “Browning Machine Gun, US Caliber .30, Aircraft, M2” in both fixed and flexible versions, the latter with double-spade handgrips. It was designated the M2 rather than the M1 to prevent confusion with the M1918M1. In 1933 a longer barrel jacket was adopted.

A problem occurred when the new M1 ammunition with heavier bullets replaced the M1906 in 1936 and upped the rate of fire by 250rds/min. This resulted in jams and added stress on the light components. The lighter M2 ammunition was introduced in 1940–41 and this lowered the firing rate. Minor internal field modifications were made to slow the rate of fire. Through the early 1930s the M2 was tested as a possible tank gun, including the T3 and T9 with heavy barrels, but these were rejected.

Colt would produce 49,681 M2s. The designation was changed to AN-M2 in 1942 under an Army/Navy program. The Navy introduced a number of modifications to its fixed and flexible M2s, known as the

The rear gunner's position in a Navy Curtis SB2C Helldiver scout-bomber. The AN-M2 twin machine guns mount small armored shields and are fitted with double-spade grips and a reflex optical sight. The pair of guns spit out 2,000–2,600rds/min. (Tom Laemlein/Armor Plate Press)





“BAM30” – “Browning Aircraft Machinegun caliber .30.” The AN-M2 would remain the main line aircraft gun into World War II. The Army Air Force began phasing out the underpowered .30-caliber in August 1942 to switch almost entirely to .50-calibers, but .30-caliber aircraft guns were still used in certain aircraft, especially by the Navy: engine cowlings, aft cockpit guns, auxiliary nose gun in B-17 bombers, gunnery training aircraft, and other applications. In all, 193,556 guns were produced by Buffalo Arms, Brown Lipe Chapman Division of General Motors of Syracuse, and Savage Arms of Utica, all in New York.

The .303 Browning was the standard machine gun for the Royal Air Force during most of World War II, despite lacking the punch of the .50-caliber. (Adam Tooby © Osprey Publishing)

The .303in Mk I and Mk II

Browning aircraft guns saw the highest foreign use of any Browning. The Royal Air Force adopted the Browning .303in Mk I in 1934 in both fixed and flexible models. Based on the Colt commercial MG38, they made several modifications after production began, resulting in the Mk II in 1937. Its jacket had 24 slots in six rows and an integral cone-shaped flash hider. Owing to the cordite propellant, the muzzle extension fouled excessively. The inside of the extension was chromed and cooling fins were added. These guns were made by Vickers Ltd and Birmingham Small Arms Company (BSA) in addition to 70,000 US-built .303in M2s. The British retained the .303in as an aircraft gun, declaring they did not need longer-range .50-caliber weapons for defending night bombers, and that the lighter ammunition allowed for slightly heavier bomb loads. It was found that the .303in was marginal for strafing. In late 1944 they began to use .50-calibers.

In 1944 and 1945 the USAAF introduced the T9 and T10, modified AN-M2 machine guns fitted with special muzzle boosters allowing lower-powered frangible bullet ammunition to be fired. Their compressed graphite shattered on impact. They were used by aerial-gunnery students flying in modified gunnery training bombers firing at Bell RP-63 Kingcobra “Pinball” fighters and target sleeves towed by other aircraft. They were modified with thicker sheet-aluminum skins, bulletproof glass replacing the normal canopy, over 100 hit-detecting microphones placed throughout the aircraft, a hit-counter, and a red light fitted on the propeller hub in place of the 37mm cannon to flash when hits were scored.

The M37C

A final Browning aircraft gun was the M37C, a modified M37 coaxial tank gun. A tank gun was selected in 1960 when helicopters were first being armed because it was capable of solenoid triggering and there were large numbers on hand since it was being replaced by the 7.62mm M73.

The XM1 armament subsystem consisted of an M37C (C = conversion) forward-firing gun mounted on landing-skid struts on both sides of Bell OH-13G/S/H Sioux and Hiller OH-23G Raven scout helicopters. A 500-round ammunition box was located beneath both guns' barrels and they had a compressed-air remote-charging system. The 450 units were replaced by the similar M2 armament subsystem with the 7.62mm M60C in 1972. A helicopter used early in the Vietnam War, the Boeing Vertol CH-21B Shawnee "Flying Banana," had an M1919A4 ground gun mounted in the left door.

.22-CALIBER TRAINING MACHINE GUNS

The M1 machine-gun trainer

During the lean post-World War I years, the Army was strapped for adequate stocks of training ammunition. The ammunition necessary for the rifleman to qualify was comparatively low, but the amount of ammunition necessary to train and qualify a machine-gunner was a different matter – especially aerial gunners. Prior to World War II the Army contracted David "Carbine" Williams to develop a sub-caliber adapter capable of firing low-cost .22 Long Rifle M24 rimfire ammunition. Tracer ammunition was also provided for aerial-gunnery training. This resulted in the M1 machine-gun trainer. (There was no M2 trainer to avoid confusion with the AN-M2 aircraft gun.) It was provided with special 100-round web belts. These suffered from frequent jams and misfeeds. It required numerous parts to be replaced in the .30-caliber gun to adapt it to .22-caliber and it could not be returned quickly to a state in which it could fire .30-caliber ammunition.

The M3, M4, and M5 machine-gun trainers

New machine-gun trainer kits were developed by Springfield Armory in 1940 with a .22-caliber barrel, special bolt, a few small replacement parts for the feed system, and three 125-round web belts. They could be converted from one caliber to another easily and quickly. However, it appears they were habitually retained in the .22-caliber configuration, to be converted to .30-caliber only if necessary. The jam-prone .22-caliber web belts were replaced by two-piece .30-caliber cartridge-sized adapters holding a .22-caliber round, used with standard .30-caliber web belts. Standardized in January 1941, these were designated the M3 trainer for the M1917A1 water-cooled, M4 trainer for the M1919A4 air-cooled, and M5 trainer for the AN-M2 aircraft guns. One kit was authorized for every three guns and issued only in the US. They were extensively used for aerial-gunnery training as this required high ammunition expenditure, but were phased out at the war's end owing to the massive .30-caliber stocks and ultimate plans to replace the .30-06 with a new round. Another training device was a cutaway M1919A4 that was twice the size of an actual gun, for group instruction purposes.



AMMUNITION

Cartridge development

Browning machine guns were chambered for the legendary “cartridge, caliber .30,” (CTG, CAL .30) variously known as the .30 Springfield, .30 Government, 7.62×63mm (in Europe), and 0.30in (in British usage until the 1960s). It is more widely known as the .30-06 – pronounced “thirty-naught-six” or “thirty-oh-six.” The “06” is the year the cartridge was standardized by the Army. This is confusing as the first rifle chambered for it was the M1903 Springfield, which was actually adopted in 1905. The M1903 was initially chambered for the .30-03, a slightly longer cartridge. It was changed to the .30-06 owing to complaints of the heavy 220-grain bullet’s recoil in a bolt-action rifle without recoiling parts to absorb the kick. This was the .30-caliber M1906 cartridge with a 150-grain bullet. The .30-06 is .308-caliber (actually 7.8mm, but called 7.62mm). Complete rounds are 3.34in (85mm) length overall. The rimless bottlenecked cartridge case is 2.494in (63.3mm) in length with a 0.473in (12mm) rim diameter. Cases are brass and weigh 200 grains. Bullet lengths vary by type, but the 152-grain M2 ball, for example, is 1.11in (28.2mm) long. With any type, 0.746in (18.9mm) of bullet extends from the case mouth.

The pointed bullets mostly had a “flat” base, but some types had a tapered boattail base. Early bullets were cupronickel jacketed (nickel-colored), while from the late 1930s they were clad in gilding metal (brass-colored), which reduced metal fouling. Most had a cannelure (knuckled groove) in which the case mouth was crimped. There was usually red sealant lacquer around the case mouth and primer pocket. Bullets weighed anywhere from 146 to 200 grains depending on type. The M2 ball achieved a muzzle velocity of 2,805ft/sec, with muzzle energy of 2,655ft lb. The maximum range was approximately 3,450yd, the same as the M1906. Realistically, point targets could be effectively engaged at about 1,100yd under ideal conditions.

The .30-06 was used in the M1903-series Springfield, M1917 Enfield and M1 Garand rifles, M1918-series BAR, and the various Browning machine guns. In World War I the standard machine-gun rounds were: the M1906 ball (cupronickel); M1917 tracer (blackened bullet); M1917 AP

US .30-caliber (.30-06 or 7.62×63mm) machine-gun cartridges (left to right): M1 ball, M2 ball, M1918 incendiary (black bullet), M2 AP (black tip), M14 API (silver tip), M1 incendiary (light-blue tip), M1 tracer (white tip), M1 tracer (red tip), M25 dim-tracer (orange tip), M22 frangible (green tip, white band), M40 dummy, M2 dummy, and M1909 blank. (Author’s collection)

(exposed lead tip); M1918 AP (second bullet cannelure); M1917 incendiary (flat nose); M1918 incendiary (blackened bullet); M1918 tracer (blackened case); M1909 blank (rolled crimp, red wad); and M1906 dummy (tinned case with six longitudinal corrugations). The AP and incendiary rounds saw little wartime use. Between the wars the M1 and M2 ball,⁷ M2 AP (black tip), M1 tracer (red tip), M2 dim tracer (white tip, then red), M1 incendiary (light blue tip), and M2 dummy (one to three holes in case) were developed.

Additional rounds were introduced during World War II: M14 API (silver tip – 1943); M25 tracer (orange tip – 1944), which became the standard tracer; M22 frangible (green tip, white band – 1944); and M40 dummy (brass case with six longitudinal corrugations). All .30-caliber tracers burned red with the exception of some early World War II M1 tracers, burning green. The M25 was called a “dim ignition” or “double-tracer,” a two-stage tracer with the first stage burning very dim and the second stage burning brighter. This made it more difficult for the enemy to detect the firing position and meant the tracers did not dazzle the firer’s vision.

The .30-06 was officially replaced by the 7.62×51mm NATO in 1954 (although no weapons were adopted until 1957), but remained in limited use into the 1970s. The 7.62mm delivered about the same performance as the .30-06 in a case 12mm (.47in) shorter. US government .30-06 production continued until 1976. The round has been produced in almost 50 countries.

.30-caliber belts and boxes

Machine-gun ammunition was issued in 250-round web belts, normally one tracer to four ball or one tracer to four AP – often used for better penetration through trees, masonry, etc. Obviously, web belts were impractical for aircraft guns; for aircraft, the ammunition was loaded in metallic-linked belts,⁸ the standard mix being two AP, two incendiary, and one tracer (the AP later replaced by API). Another mix alternated one ball with one tracer. The recommended bullet mix for guns in the antiaircraft role in World War I was a tracer, ball, incendiary, ball, AP, and then repeated.

These were called “disintegrating” metallic-linked belts as each link separated from the belt as the cartridge was withdrawn and the belt “fell apart.” The M1 metallic-linked belt was adopted in 1931 and restricted to aircraft guns. A 3½in-long metal starter tab allowed faster loading. The more flexible M2 metallic-linked belt was adopted in 1940; it did not work well in linking machines and if fed into the gun from the tail end, it jammed. M1 links still worked if fed in reversed, and the M2 was withdrawn. In the late summer of 1944 some ground units received metallic-linked belts. While web belts remained in use through World War II, the metallic-linked belt became standard for all guns. (Marlin, Colt, and Vickers web belts were not interchangeable with Browning belts.)

7 M1 and M2 ball had gilding-metal jackets, but the M2 had “silvered” bullets to differentiate from the M1 until 1940. M1 ball was used throughout the war. The Navy retained M1 ball into 1941 for aircraft guns and it was identified by a silver tip (not to be confused with M14 API).

8 Disintegrating metallic-linked belts were first invented for Vickers aircraft guns in 1917 by William de Courcy Prideaux, a Frenchman residing in Britain.



An M1917 positioned in a field, Camp Pine, New York, 1935. The wooden M1917 and M1917A1 ammunition boxes were painted OD. They were not expendable, but organizational equipment. Companies often painted their designation on the boxes in black paint. (Tom Laemlein/Armor Plate Press)

Prior to the adoption of the metal boxes, the 250-round M1917 and M1917A1 wooden chests were used, both measuring $12\frac{3}{4}\times 8\times 4\frac{1}{2}$ in; the M1917A1 had one angular corner to accommodate the M1918 tripod, though it was never issued. They had a leather or web carrying handle and the lid was non-removable. They were issued with the machine gun and filled with belts by the crew. They were not water- or dust-proof and deteriorated in the tropics.

Standard $1\frac{1}{2}$ in-wide web belts were the 250-round M1917, 150-round M2 (withdrawn in 1940), and 100-round M3 for confined tank and other vehicle-mounted gun use. Web belts were white, with OD being introduced in 1944. There was a 3in-long brass or blackened-steel “starter tab” (officially called an “end clip,” or, from 1940, “ammunition belt tip”) riveted to both ends (only one end from 1943).

The required qualities of web and metallic-linked belts were massive. One firm producing metallic-linked belts from 1950 to 1954 turned out 29,000,000 M1 links. In World War II the Russell Company produced 260,000 miles of web .30- and .50-caliber belts. Belted ammunition was issued with 1,500 rounds in six 250-round web belts or 1,200 rounds in metallic-linked belts, both in M1917 wooden boxes. Aircraft metallic-linked belts were also packed in smaller M9 wooden boxes of 480 rounds in two 240-round M8 key-and-strip-opened cans, each holding two 120-round cartons. The most common packing method was four 250-round metal boxes in a wire-bound crate with 1,000 rounds. Ammunition was also issued in wooden boxes in 20-round cartons to be loaded in the field into belts in desired mixes by the unit. There were 180 empty 250-round web belts packed in an M1917 wooden box.

The M1 and M1A1 ammunition boxes were OD-painted stamped-steel boxes holding 250-round belts. They had a folding carrying handle on the top and a rubber gasket-sealed, removable lid. They differed in the lid's latch and means of attachment to the M1917A1 tripod. The M1 introduced in 1942 measured $3\frac{3}{4}\times 7\frac{1}{4}\times 10\frac{3}{4}$ in and the M1A1 $31\frac{3}{16}\times 7\frac{1}{4}\times 11$ in. The M1A1 was adopted in June 1945 and saw no World War II use. The M19A1 box (aka later “NATO can”) was adopted in 1946 and replaced the earlier boxes by the 1960s. It measured $31\frac{3}{16}\times 7\frac{1}{4}\times 11$ in. A full .30-caliber box weighed 22lb. AN-M2 flexible guns usually used a 100-round ammunition box.

GROUND GUN MOUNTS

Tripods

Tripods were the standard mounts for .30-caliber Browning machine guns. The tripod designs for the water- and air-cooled guns were very different. There were also a variety of vehicle mounts, which accepted .30-caliber or .50-caliber machine guns. A common complaint concerning HMG tripods stemmed from their weight. They had to be heavy, though, to provide a stable firing mount that did not shift around or shake the gun off target. They also had to absorb the weapon's recoil.

The **M1917 tripod** for the M1917 HMG consisted of a socket to which the three legs were attached by locking clamps. Each leg could be adjusted independently on uneven ground. The legs could also be adjusted to vary the gun's height above ground by spreading the legs. The two front legs could be folded back with the trail leg, to which a leather leg-securing strap was attached. The cradle's pintle fitted into the socket and latched in place to prevent it being pulled out and served as a break to prevent free rotation. It could be locked on a specific azimuth (direction) to fire on a fixed line horizontally or at any elevation. The traversing dial atop the socket was graduated from 0 to 6,400 mils. The cradle held the gun and allowed it to be elevated and depressed. Its elevation could be free or locked at a specific elevation for indirect fire. The M1917 had insufficient elevation for effective antiaircraft fire. The M1917's cradle had a long extension to the rear on which the elevating scale and hand screw were fitted. The tripod and cradle weighed 52lb 6oz. M1917 tripods were made by Nelson Blower & Furnace Company of Boston, Massachusetts and Crown Cork & Seal Company of Baltimore, Maryland.

Two other tripods were available. The Browning had been designed so it could be mounted on the **Mk IV tripod** for the Colt-built Vickers M1915. The United States designated this Colt-made 56lb tripod with the British designation, the same tripod as used with the Vickers Mk I. Kept in reserve

The 1920s: a machine-gunner clad in blue denim fatigues cleans the Browning's small number of internal parts. The M1917 is mounted on the complex and unpopular M1918 tripod, which was soon relegated to depot storage. (Tom Laemlein/Armor Plate Press)



storage and not used by the United States, they were supplied with M1917 HMGs provided to Britain under Lend-Lease. The lighter (45lb) **M1918 tripod** was developed at the war's end. It boasted a number of innovative features, but was overly complex and disliked by crews. They were held in reserve storage. Some were provided to the British with M1917 HMGs and in small numbers during the Army's build-up before World War II to make up for M1917A1 and M2 tripod shortages. They were manufactured by the Standard Equipment Company of Boston, Massachusetts.

Improvements were made in the M1917 tripod in the early 1930s and a variety of cradle designs were tested. A much improved, simplified, and lightened cradle replaced the original in 1935 and was redesignated the **M1917A1**, notably four years before the gun itself was redesignated the M1917A1. The original tripod legs and pintle socket were retained. The new cradle allowed increased elevation and depression. The gun was mounted in the cradle in the line-of-recoil to reduce vibration. The M1917 mount had separate controls for traversing and elevating, while the 51lb M1917A1 combined them in a single assembly. Ammunition boxes could be attached to the left side of the cradle on M1917 and M1917A1 cradles. Tripod conversion took place through the late 1930s. M1919A4 guns could be mounted on the M1917A1, but seldom were. One exception was that some engineer units, authorized two M1917A1 HMGs per platoon for work-site defense, were substituted M1919A4s, but with M1917A1 tripods.

There had long been complaints about the M1917A1 tripod. In 1951 the 29lb 8oz **M74 tripod** was adopted. It was made of aluminum alloy with steel fittings and reinforcements. The legs could break at the pivots with rough handling. Only small numbers were acquired after the Korean War and it saw little use with the M1917A1. Some saw use with the 57mm M18A1 and 75mm M20 recoilless rifles – although they mainly used the M1917A1 tripod – and the new M60 GPMG early on, when its M122 tripod was not available.

The first tripod for the early test M1919-series ground guns was the 10lb 8oz **Mk I emergency tripod**. The small tripod was developed as an emergency mount, allowing the M1919 tank gun to be used dismounted. It was also initially used with the M1919A2 cavalry gun. Adopted in early 1919, it consisted of three short square cross-section legs with a leather securing strap attached to the right front leg. It was attached to the gun by a locking clamp around the barrel jacket just forward of the receiver.



One of several types of anti-aircraft tripods available for the M1917, which explains the otherwise excessive length of the condenser hose, 1930. (Tom Laemlein/Armor Plate Press)

Machine-gun crews would often set up their guns for anti-aircraft defense while aboard ships and large landing craft, if an aerial threat was present. Manning an M1917A1 on an M1917A1 tripod, this crew wears M1926 life-preserver belts. The .30-caliber machine guns were marginal air-defense weapons; their main benefit against attacking aircraft would be the psychological effect of tracer streams coming at the pilots. (Tom Laemlein/Armor Plate Press)





A USMC M1917 mounted on a makeshift plank and sandbag arrangement in a light truck in Shanghai, China, 1937. For close-in protection an M1918 BAR-armed rifleman is provided. (Tom Laemlein/Armor Plate Press)

tripod head with the pintle adapter. There was a sliding traversing bar connecting the rear legs. The T&E mechanism attached to this bar and to an attachment on the bottom rear of the receiver. The gun could be operated with the T&E mechanism detached or removed from the gun to allow a completely free gun. The tripod's height and angle of legs could not be adjusted to accommodate rough ground. It gave the gun a low profile, only 16½in high. The rear legs could be folded inward by unlatching the right end of the traversing bar and it would be slid back on the legs to allow them to be folded. The forward leg was then folded back. The traversing bar was graduated in mils and allowed the gun to be traversed 444 mils left or right. (The modified M2 later became the M122 tripod for the M60 GPMG and was used by the Marines with the M240G machine gun.)

M2 tripods were produced by Acklin Stamping Company of Toledo, Ohio; Alliance Manufacturing Company of Alliance, Ohio; Appliance Manufacturing Company of Alliance, Ohio; Bingham Stamping Company of Toledo; Evans Product Company of Detroit, Michigan; Houde Engineering of Buffalo, New York; Lampson Corporation of Syracuse, New York; Lovell Manufacturing Company of Erie, Pennsylvania; and Rock Island Arsenal, Illinois.

Originally the leg feet were too small and they sank into the ground during firing, but they were enlarged. Finalized production tripods had a gun bracket that was secured by a pin through the trunnion hole in the bottom forward end of the receiver rather than clamping to the barrel jacket.

The Mk I was replaced by the M2 tripod in the mid-1930s. The cavalry-designed 14lb T7E1 tripod had been standardized as the M2 on December 21, 1933. Additionally, each light and medium tank, M8 armored car, M3 halftrack, and tank recovery vehicle had an M2 tripod to operate a dismounted M1919A4. This would become the standard mount for future M1919-series LMGs. It consisted of a short front and two longer rear legs fitted to a triangular-shaped

Vehicle mounts

World War II saw a wide variety of mounts fitted on vehicles, most being specifically designed for given models. The many types of .50-caliber vehicle machine-gun mounts would also accept a .30-caliber weapon. Both machine guns' pintles and the size of locking pins were the same, so mounting cradles were interchangeable.

World War II vehicle mounts*

Mount	Vehicles
M24 and M24C pedestal mounts	½-ton weapons carrier
M24A1 pedestal mount**	¾-ton truck
M24A2 pedestal mount	¾- and 1½-ton trucks
M25 pedestal mount**	halftracks
M31 pedestal mount	¼-ton truck (jeep)
M35 skate mount**†	M3A1 scout car, mortar halftracks and amtracs
M48 dash mount***††	¼-ton truck (jeep)

* .50-caliber MGs were primarily used on these mounts, but .30-calibers could also be used.

** Mainly for .30-caliber MGs.

† Skate mounts incorporated a rail running around the inside of the troop compartment on which the gun could be moved to different positions. The mounts included the M30 skate trolley.

†† The dash mount was fitted on the jeep's dashboard in front of the passenger seat and could not mount a .50-caliber.

Other ring mounts were designed for specific cargo and specialized trucks and mainly mounted .50-calibers, but could mount .30-calibers: M32, M36, M37, M37A1–A3, M49, M49C, M50, M56, M57, M58, M59, M60, and M61. The Navy fitted Mk 19 machine-gun pedestal mounts on PT boats, various landing craft, and other small craft. The Navy provided a $\frac{3}{8}$ in thick, 27½×27in gun shield.

A Marine M1917A1 fitted on an M48 dash mount. The extender has been lowered to almost dash level. It could be mounted on the M1917A1 tripod's cradle or on simple brackets as here. Note a holder for a water chest has been unit-fabricated and attached to the jeep's side below the insignia. (Tom Laemlein/Armor Plate Press)

TRANSPORTING THE GUNS

Carts

In World War I an M1917 HMG squad was equipped with two **Model of 1917 carts**, nicknamed *voiturettes* (French for carts). These were small wooden carts with two wooden-spoked, steel-rimmed wheels. They could not carry crewmen and were drawn by a single mule or pulled by four men. The machine-gun cart had a center rack for five ammunition boxes and two water chests, a compartment for the gun, a spare barrel, a pair of asbestos mittens, and a cleaning rod.



Machine-gunners take a break during maneuvers. Their gun is on a Matthews mount, which is coupled to an M1917 machine-gun cart, called a *voiturette* (French for cart) during World War I. Similar to the USMC's Cole cart, it was wider and the gun could be fired from it. Six ammunition boxes and water chests could be carried in the small cargo compartment. (Tom Laemlein/Armor Plate Press)



Straps were provided on one side for the tripod. The condenser hose, belt-filling machine, M1914M1 80cm base rangefinder and tripod, and a metal tool box were also carried. The ammunition cart had two racks for six boxes each and a water chest, carpenter tool roll, and two tool and accessory boxes plus signal flags. Both carts carried a curry comb and brush, grain and feed bags, a mule gas mask, mule shoes and nails, picket pin and ropes, canvas water bucket, shovel, pick-mattock, and hatchet. Two spare gun carts were assigned to each machine-gun company to carry two guns and two tripods each plus accessories and tools.

The **M1 machine-gun wheeled mount** (aka Matthews mount) was used from 1929 to 1939. It was simply an axle with bicycle-like wheels, a drawbar (on which a spare barrel was attached), and a rack over the axle for six ammunition boxes and a water chest. The M1917A1 tripod's front legs locked on to the ends of the axle and the trail leg on the drawbar.



A Marine M1917A1 is mounted on a toboggan sled using bolted-on 2x4in boards, 1947. Normally used for man-hauling supplies over snow, it could also be dragged over grass and bare ground if necessary. (Tom Laemlein/Armor Plate Press)

The gun could be fired from the mount and the wheels could be removed in three seconds and the chassis set flat on the ground. A T4 anti-aircraft adapter could be fitted to raise the height of the gun for air defense.

The small **M4 and M4A1 handcarts** were used in World War II. These were 87lb 8oz aluminum-constructed carts with two rubber tires on 12in wheels. Each was provided with a T-shaped drawbar drawn by two men. In mud or over steep ground, two hand-drawn ropes could be attached to allow two more men to pull. There were mounting clamps on the 2x2½ft bed that allowed the tripod to be attached with the gun mounted. It could be fired from the cart. Five ammunition cans, the water chest, and a spare-parts box were carried. A second cart carried ten or more ammunition boxes, tools, and accessories.

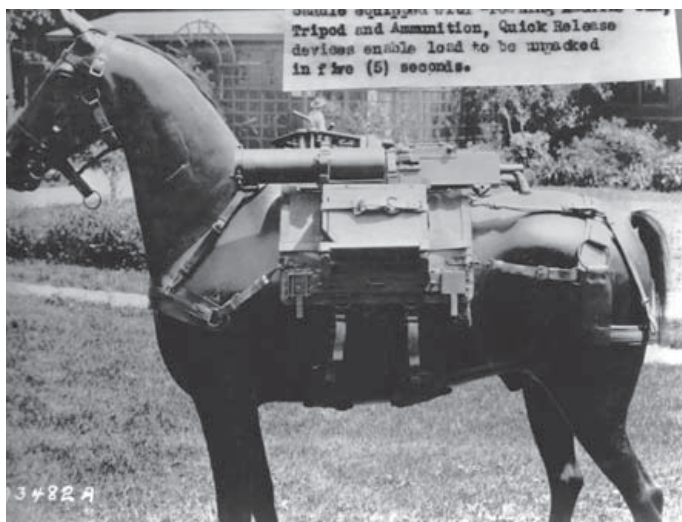
The Marines used an equally small hand-drawn cart, the “**Cole cart**,” on two small bicycle-like wheels that were larger than those of the M4 cart. It had a small, low-sided cargo compartment. It had originally been designed in 1917 for the Lewis gun by Major Edward B. Cole, who was killed in France commanding the Marine 6th Machine Gun Battalion assigned to the Army’s 2nd Division. The “Cole cart” was used into early World War II and replaced by the M4A1.

In World War II, Army HMG squads were authorized a ¼-ton truck (jeep) and a ¼-ton two-wheel trailer along with an M48 dash mount. The two machine-gun platoons often gave up their jeeps to the battalion headquarters. While M4 handcarts were not in the equipment tables, many units were issued them, especially when conducting amphibious assaults, as they aided getting the guns across the beach.

Pack mules and horses

A machine gun, ammunition, and equipment could be carried on **Phillips cargo pack saddles** consisting of the M3 tripod and gun hanger, M8 ammunition hanger, three ammunition chests, spare-parts chest, canvas gun cover, and M9 canvas spare-barrel case. **Packboards** were also employed; machine guns were strapped to the board muzzle-down, with the rear end of the receiver at the board’s top and extended above the packboard in order to achieve the preferred high center of gravity. The guns and tripods were not to extend much below the packboard. Both the M1919A4 gun and tripod could be carried on a single packboard, while the M1917A1 required packboards for the gun and the tripod plus three more for ammunition. Three 22lb ammunition boxes could be carried on a packboard.

An M1917 machine gun and equipment attached on a Phillips pack cargo saddle. It was designed to be dismounted in a very short time. Interestingly, and not readily apparent at first glance, the horse is a mock-up used for packing practice. (Tom Laemlein/Armor Plate Press)





USE

Workhorses of the forces

OPERATING THE .30-CALIBER

This photograph of a Browning M1917 on an M1917 tripod offers a good view of the elevating handwheel and dial below the handgrip. The leaf rear sight is in the raised position and an ammunition belt has been inserted. The brass feed tab can be seen. On the muzzle end of the water jacket can be seen the chained plug for the condenser hose connection. (Tom Laemlein/Armor Plate Press)

Whether a water-cooled or air-cooled version, .30-caliber Brownings operated similarly. The main difference was the set-up of the mounts. The water-cooled gun had different requirements, of course.

The M1917A1

With the M1917A1 the gunner carried the tripod and placed it in the position indicated by the squad leader. How low or high it was set depended on available cover and angle of fire. The tripod could be set with its legs flat on the ground or fairly high, especially for indirect long-range and antiaircraft fire. Rather than flat on the ground, though,

it was best to place a sandbag under the pintle socket, raising it 6–8in off the ground. The legs were locked in place by clamps, the gun was set on the tripod, the pintle latched in place, and the gun layed in the direction of fire. Ideally, a sandbag or two was placed on each leg, especially for long-range fire.

The water jacket was filled with 7 pints of water before moving into the firing position. The filler cap was at the rear end of the jacket's upper right side. It was filled using a leather funnel. The water jacket was not completely full.



The steam-escape tube ran the length of the jacket near the top and consisted of a fixed inner tube with a small hole in both ends and a sliding outer tube. The outer tube was short enough that it could not cover both inner tube holes at once. It would slide up and down the inner tube as the gun was elevated and depressed, keeping one hole above the water level so it would not leak out. As the water heated it condensed to steam and was vented through the condenser tube. This was attached to the hose connection on the lower left side of the muzzle end cap. There was a drain plug on the bottom of the jacket's front end. The hose ran into the water chest and condensed back to water as the steam vented into the chest. When partly filled, the water would be poured back into the water jacket. The chest had an oval lid on the top with a carrying handle and a drain plug on the bottom.



The gun could be fired without water, but not for long. The 3lb barrel (4½lb lighter than the M1919A4's) was very thin, heated rapidly, and heat was contained by the jacket. The jacket would eventually conduct heat, but it was too hot inside the jacket to effectively radiate heat. Adding water after it reached a high temperature could warp the light barrel. Water supply was a problem in some areas: for example, in the desert and some mountain regions. With care two water chests could be recycled and would last for some days. Melted snow could be used, water recovered from damaged vehicle radiators, and urine if necessary. In at least one instance wine was used, much to the crew's chagrin. Water was lost through leaks in both ends of the barrel. The muzzle protruded through the front cap and the rear end of the barrel through the trunnion block, which served both as a jacket end cap and the fixture for the mount. The barrel recoiled $\frac{5}{8}$ in (16mm), so it was impossible to completely seal the opening. Partial sealing was accomplished by a special manner of wrapping the muzzle and a groove around the rear end with asbestos cord.

The timing and headspace had to be set correctly. The headspace was adjusted by screwing the barrel in the proper distance from the bolt face and it was checked with the headspace gauge. Incorrect headspacing could damage the action's moving parts, cause extraction problems, rip the head off a case in the chamber (ruptured cartridge), or cause wider bullet dispersal. If too tight, the weapon would not fire. Field-expedient headspace adjustment could be made without a gauge. The bolt was pulled to the rear by $\frac{3}{4}$ in; the barrel was then screwed into the barrel extension using the point of a cartridge or the combination tool until the action would just close and the recoiling parts would go fully forward without being forced, and then the barrel was unscrewed two notches.

A gunner scrapes ice off an M1917A1 fitted to an M48 dash mount on a ¼-ton jeep. Such icing had little effect on the gun if it was properly cleaned. The dash mount had an extender that allowed the gun to be raised above windshield level. With the windshield lowered or removed, the gun could be positioned just above hood level. (Tom Laemlein/Armor Plate Press)



M1917A1 crew drill (opposite)

The crew drill for the M1917A1 was an involved process, with variations for different situations. This prewar crew is practicing a typical drill to set up the gun under normal circumstances. The squad leader was a corporal who directed where the gun was to be positioned and its direction of fire. He is not pictured in the second and third phases. The rest of the crew is comprised of the No. 1 (gunner carrying the tripod), No. 2 (assistant gunner carrying the gun), and No. 3 (ammunition bearer carrying the water chest and an ammunition box). Not pictured are the No. 4, carrying the spare-parts chest and an ammunition box, and the Nos 5 and 6, each with two ammunition boxes. They would be further to the rear, all armed with pistols at this time.

From 1942, ammunition bearers would have M1 carbines and the squad leader an M1 rifle with an M7 grenade launcher. From February 1944, HMG squad leaders were sergeants. Not pictured here, the completely assembled gun on its tripod could be carried by three men, each lifting a tripod leg, the left-leg man carrying the water chest, the right-leg man carrying an ammunition box, and the rear-leg man being the gunner.

From top to bottom: **(A)** The No. 1 (gunner) is prepared to move to the designated gun position. The No. 2 (assistant gunner) has the gun; the No. 3 (ammunition bearer) is behind him. **(B)** No. 1 is setting up the tripod while No. 2 brings the gun forward. **(C)** No. 1 is seated in the firing position while No. 2 is mounting the gun; No. 3 is bringing the water chest and an ammunition can forward. Once the gun is mounted, No. 1 adjusts the sight and readies it to accept the ammunition belt. No. 2 will feed the belt into the gun and insert the water hose in the water chest.

The M1917A1 cradle allowed the gun to be slightly traversed 100 mils to either side without rotating the cradle by using the traverse handwheel on the right side of the cradle's end. The elevating handwheel was below this. It could be elevated to 65 degrees for better aircraft engagement, or depressed minus 28 degrees. Clamps allowed it to be locked at any elevation and azimuth.

The ammunition belt was checked to ensure rounds were correctly and uniformly loaded, dry, and free of mud and dirt. The ammunition box could be set on the ground or attached to the cradle's left side. The belt tab was inserted into the feed slot on the left side and from the right the tab was pulled through until it stopped. The first cartridge was in the feedway. The bolt handle on the right side was pulled back as far back as it would go. It was most effective to grasp the handle palm up. The handle was released, the bolt would run forward, and the gun was now half-cocked with the first round extracted from the belt and in a position to be chambered. It could be left this way to be ready for action. Pulling the bolt to the rear a second time and releasing it would run it forward to chamber the round.

There was no means of placing the gun on safe (trigger locks – safety levers – were removed from M1917s in 1929). With the rear leaf sight elevated and set on the estimated range, the gun was aimed. The right hand firmly gripped the pistol grip with the forefinger beneath the trigger and the left hand cupped atop the recoil buffer and pistol grip. It was fired by pressing upward on the trigger. The gun fired full-automatic only, but single shots could be triggered off easily. Bursts could vary from six to

Browning M1917A1 accessories

M1918 belt-filling machine and chest
M1917 clinometer and leather case
M1917 *or* M6 combination tool
M5 combination wrench
M8 elevating-mechanism wrench
M4 carbon-removal tool
Machine-gun oil can (12oz)
Headspace and timing gauge
Mk IV ruptured cartridge extractor
M1 four-section cleaning rod and canvas case
M2 *or* M2A1 one-piece cleaning rod
M2 cleaning brush
M6 bore brush
Barrel reflector (for examining bore)
M1 *or* M1A1 water chest
3-gallon water canteen with carrying strap
(seldom issued)
Steam condenser device (hose) and canvas case
Leather filler cup (funnel)
Asbestos mittens
Clamp-on antiaircraft front ring sight*
Clamp-on carrying handle
M1917, M1923, *or* M8 flash hider
Blank-firing adapter
M1917 wooden accessory and spare-parts chest *or*
M5 steel accessory and spare-parts chest
Spare bolt canvas case
M1 canvas spare-parts envelope
M2 canvas tripod cover
M6, M10, *or* M12 canvas tool rolls
M13 *or* M14 canvas spare-parts rolls
M1 M1917A1 canvas cradle cover
M7 M1917A1 canvas machine-gun cover
M9 canvas spare barrel cover

*This was issued only to Coast Artillery units
with an antiaircraft role.

20 rounds depending on range, target size, and desired effect. This was learned through gunner experience. Often a series of rapid short bursts were more effective than long bursts, as the repeated short bursts reduced the bullet impact dispersion. In many situations it was desirable to spread the series of bursts depth-wise or laterally. The belt or links were fed/ejected through the right side of the receiver and ejected cases out of the bottom.

If the gun failed to fire or had a stoppage, the bolt handle was pulled to the rear, released, and the trigger pressed again. If it still failed to fire, the feed cover was tapped, the end of the belt was yanked to the right, the left hand holding the belt where it entered the feedway, the bolt was again pulled to the rear and released, and then the trigger pressed. In the event of a runaway gun owing to a cooked-off round in an overheated chamber, the left end of the belt was gripped a half-foot from the feedway and twisted hard to jam the belt.

To clear and unload the gun, the cover latch on top of the receiver and to the rear of the sight was moved rearward and the feed cover opened. The belt was pulled out to the left, the bolt handle pulled rearward, and the feedway checked to ensure there was not a cartridge in the chamber. The extractor was pressed down to its seat in the front of the breechblock, the cocking handle released, and the breechblock run forward. The feed cover was closed and the trigger pressed.

The M1919A4

The M1919A4 operated essentially in the same way. The M2 tripod was the main difference. The collapsed tripod's front leg was folded forward, the rear legs spread, and the traverse bar connecting the legs automatically latched in place when fully spread. The gun was carried with the detachable pintle already attached and was inserted in the tripod's pintle socket. If used, the traverse and elevating mechanism was attached to the bottom rear of the receiver. It was swung rearward and the stem latched

into a groove in the bottom of the pistol grip to prevent it from swinging. With the gun on the tripod, the T&E mechanism was unlatched from the grip and clamped to the traverse bar. It could be slid back and forth to traverse the gun and the elevation wheel turned to adjust the vertical angle. The T&E was little used. It was useful for when the gun was set up for a predetermined direction of fire at night.

The M1919A6 could also be used on the M2 tripod. The shoulder stock could be retained or removed for tripod-firing and the bipod folded up. The bipod could be removed by first removing the flash suppressor/recoil booster, removing the bipod, and reattaching the suppressor. This was seldom bothered with. If removed, the bipod could be lost; having the bipod in place was beneficial, as the A6's barrel was much lighter than the A4's, and the bipod helped radiate barrel heat with prolonged firing. For bipod firing, the legs were folded down and adjusted to accommodate rough ground. The gunner assumed the prone position with his right hand on the pistol grip and his left hand gripping the small of the shoulder stock to help stabilize the gun.



Marines of the 5th Marine Division on Iwo Jima display souvenirs. The M1919A4 visible here has been camouflage-painted. This was also done on M1917A1s, especially the water jacket if not the receiver. M2 tripods were usually not painted, but M1917A1 tripods were often painted olive drab (OD). (Tom Laemlein/Armor Plate Press)

MACHINE-GUN TACTICS

The HMG's primary role was to provide accurate long-range indirect fire at both point and area targets. Depending on the size of the target and its range, it was most effective when a two-gun section or four-gun platoon was employed in what was called *in battery*, that is, the guns would engage



A Marine on Iwo Jima rests beside his M1919A4. A well-made carrying handle has been attached with clamps. Note how it is angled to the left to provide a clear line of sight. (Tom Laemlein/Armor Plate Press)



An M1919A4 crew marches to the front. The assistant gunner carries the gun while the gunner carries the M2 tripod and ammunition. This allowed the gunner to set up the tripod and position himself behind it as the assistant mounted the gun. The T&E mechanism is clipped to the handgrip. (Tom Laemlein/Armor Plate Press)

the target in unison. Targets were selected by visual observation, from patrol reports indicating the target on a map, or purely by map reconnaissance and selected as possible enemy positions or routes of advance.

The *trajectory* is the path of the bullets and the *ordinate* is the highest altitude the bullets reach. In a burst of fire, bullets do not follow the same path or impact at the same point. There is a certain amount of spread owing to minuscule differences in propellant weight, gun vibration caused by recoil, and wind, not unlike a water hose spray. The path of bullet trajectories is called the *cone of fire*. The area the burst impacts in is the *beaten zone*. The closer to the gun, the longer and narrower the zone is and the lower the trajectory – its maximum ordinate.

Beaten zone approximate dimensions*

Range	Dimensions	Maximum ordinate
500yd	140yd long by ½yd wide	1yd
1,000yd	80yd long by 1yd wide	4yd
1,500yd	5yd long by 1yd wide	15yd
2,000yd	4yd long by 2yd wide	36yd

* The dimensions are on the long axis of the line of fire.

Classes of fire referred to the delivery of fire on the target. With *fixed fire*, the gun was laid on a small target requiring a single beaten zone such as a crossroads, small bridge, or an antitank gun position. *Searching fire* was when each burst was distributed in depth to a different beaten zone on the line of fire – the range was increased slightly with each burst.

Traversing fire was distributed in width with successive changes in the lay of the gun. This was usually accomplished by a technique called the *gunner's tap*. The gunner fired a burst and tapped the side of the receiver with his palm to traverse the gun approximately 2 mils and this was repeated after each burst. *Frontal fire* in respect to the target was the same as traversing, that is, the fire was delivered at a right angle to a linear target such as a line of advancing infantry. *Oblique fire* was when the target area or its long axis lay at an angle to the lay of the gun. The gun had to be traversed and the elevation increased or decreased with each burst. *Enfilading fire* was when the line of fire and the beaten zone coincided with the long axis of the target. *Flanking fire* was perpendicular to a linear target, such as firing on a column of troops from their flank (side).

Grazing fire, because of short range on level ground or a shallow uniform slope, had a trajectory close to and approximately parallel to the ground and did not rise above a standing man. *Plunging fire*, usually delivered at longer range owing to its high ordinate, was attained when the ground in the target area sloped upward or when the gun fired from high ground at a target on lower ground, when the cone of fire fell at a more abrupt angle to the ground's surface.

Indirect fire was usually accomplished by plunging fire. The beaten zone would usually be shorter on the line of fire, but wider. The section or platoon in battery would be given the range and azimuth to the target. The M1917 clinometer carried by squad leaders was used to measure the gun's elevation. It was set on the top of the receiver, the desired elevation set, and the gun elevated and locked in position. The elevation was determined from the firing table (a card) in ammunition boxes, which gave the necessary elevation for specific ranges. On the order to fire, the guns would fire long repeated bursts until the target was neutralized. Individual guns could be assigned to traverse back and forth to cover area targets. Indirect-fire planning and procedures could be quite involved.

Direct laying or direct fire was when the target was visible to the crew. Usually a section's two guns would cover the same *primary sector* from the *primary position*, enabling them to keep up near-continuous fire by alternating bursts. If one gun was disabled, the other still covered the sector. There was no prescribed interval between the guns; 10–20yd would



Marines lay down suppressive fire on a Japanese position prior to the infantry launching their attack. The steam coming off the M1917A1's water jacket may indicate that the gun is being fired dry. (Tom Laemlein/Armor Plate Press)

An M1917A1 crew searches for targets. The M1 ammunition box, with its lid removed, is attached to the gun's cradle. Often the ammunition box was merely set on the ground. The bronze end cap has been painted black, but the paint quickly rubbed off. (Tom Laemlein/Armor Plate Press)



Infantrymen dig into a front-line position within a French forest. Since the trees prevented long-range fires, the M1917A1s were positioned forward along with M1919A4s to provide dense defensive fires. (Tom Laemlein/Armor Plate Press)



be typical. Whether two or four guns, they were positioned within earshot of the section/platoon leader. An *alternate position* allowed the guns to continue to cover the primary sector. A *supplementary position* covered a different sector than the primary, to protect an exposed flank or secondary approach route.

Final protective fires (FPF) were established with both LMGs or HMGs. Guns were positioned along the front and flanks and assigned primary sectors of fire, preferably overlapping. They would also be assigned an FPF line. These were predetermined fixed firing lines aimed

obliquely across the unit's front and unit flanks. As the enemy attack closed, on order (oral or flares) the guns would be set on the pre-planned FPF lines. This was accomplished by laying the barrel against aiming stakes driven into the ground. They could also be laid by setting the prescribed elevation and azimuth on the T&E mechanism. The FPF line was about 1yd above ground level – grazing fire. The guns commenced firing at a rapid rate with repeated bursts until the attack was broken.

Practical rates of fire, having nothing to do with the theoretical cyclic rates of fire, were the number of



Marines at a combat-training center practice firing M1919A4s and M1917A1s handheld. The M1919A4 has cloth tightly taped around the barrel jacket, while the M1917A1 is supported by a sling made from a 250-round web ammunition belt. (Tom Laemlein/Armor Plate Press)

rounds fired in bursts in a given timespan. Long hammering bursts running a whole belt through the gun were impractical. The M1919A4 with its heavy barrel could fire about 60rds/min for 30 minutes. With a cool barrel, though, it could fire 150rds/min for the first 15 minutes of firing and then went to the previous rate. The M1919A6, with a lighter barrel, could fire 40rds/min indefinitely – low rate of fire. The medium rate of fire was 75rds/min for 30 minutes. At a rapid rate of 150rds/min it would overheat after five minutes. The M1917A1, being water-cooled, had an indefinite rate of 125rds/min – medium rate. The rapid rate of fire, 250rds/min, would cause steaming within 2–3 minutes.

The Browning could be fired handheld. It is not just an implausible act depicted in movies. The M1919A4 weighed 31lb without a tripod; the M1919A6 was 32lb 8oz, and the M1917A1 31lb 10oz dry and about 40lb wet. An average soldier could easily lift a gun. It is argued that the full-automatic recoil would make it uncontrollable to aim, but in fact the weapons' very weight and fully recoiling action countered much of the recoil. A 19lb 6oz M1918A2 BAR could be easily controlled when firing from the hip. The barrel jacket would quickly heat to the point that it could not be held by a bare hand, however. It could be held by the M1919A6's carrying handle or a homemade bail handle on an M1919A4. Insulated gloves (unlined leather gloves offered no protection), an asbestos mitten, or a towel or shirt offered sufficient protection. Aiming was problematic, though, as they were fired from hip-level, and was mainly accomplished by sensing bullet impacts or following the tracer stream. In practice, it was seldom done, but there were instances when it was. The author has fired an M1919A6 handheld at close-range targets.

A Marine on Saipan with his M1919A4. A web belt has been wrapped around the barrel jacket, allowing it to be handheld-fired. He carries a Japanese dispatch case, probably for machine-gun repair parts and/or personal items. (Tom Laemlein/Armor Plate Press)



INTO ACTION – WORLD WAR I

World War I saw the introduction of many new weapons including airplanes, tanks, and poison gas. At the tactical level the machine gun would become a predominant weapon, making No Man's Land the deadliest terrain ever. At the outset of war, however, the means of employing large numbers of machine guns was little understood. There was no doctrine other than employing small numbers to support infantry in the defense. As late as 1915, General Sir Douglas Haig, commanding the British First Army, described the machine gun as "a much overrated weapon." Events would prove him wrong, as on the first day of the July 1916 Somme offensive, the British suffered over 57,000 casualties in 13 divisions – 20 percent of the fighting force. At least 80 percent of these losses were attributed to machine guns. Some estimate that up to a quarter of World War I's 22 million casualties were caused by the weapon.

Prior to the turn of the century, machine guns had been viewed as a form of artillery and even mounted on two-wheel carriages. This view changed, however, and by the time of World War I, more portable tripods had been adopted. It was realized, too, that the guns had to be concealed and protected from rifle and machine-gun fire. As the vast armies dug in for protection from overwhelming artillery, massed machine guns positioned with overlapping fields of fire, and protected from artillery and mortars, made it suicidal to cross the cratered, barbed wire-entangled fields of mud separating the trenches. Besides providing sweeping automatic fire

just above ground level to chop down waves of infantry, there were other means of employing the deadly guns. Machine guns were set and locked to fire on designated lines aimed diagonally across the front line in interlocking bands. This ability to lock the elevation and azimuth (direction) of a machine gun's line of fire allowed for very accurate fire rather than that provided by a handheld, heavily recoiling free gun. The guns would fire repeated bursts as the infantry stumbled into the lines of fire.

Machine guns were also capable of delivering indirect, or plunging, fire at long ranges. This allowed machine guns to lay barrages of bullets (beaten zones) on area targets up to 4,500yd away. There were instances of follow-on infantry battalions being decimated as they walked across the open ground from the second-line trenches to the first line and so were incapable of crossing the start line for their assault. Machine guns could also deliver plunging fire to reach behind hills. Angle-measuring devices (clinometers) and range tables were provided to calculate indirect fire. Machine guns could also fire over the heads of advancing friendly troops to support their assault. Heavy mounts were necessary to provide stable mountings for the guns and typically weighed more than the gun.

At the beginning of the war, the belligerents possessed small numbers of machine guns. Germany had begun the war with some 12,500 Maxims; each infantry division deployed 72 machine guns – six per infantry battalion. The Germans later added a divisional machine-gun battalion and a company to each infantry battalion. The British initially had 26 per division – two machine guns per battalion. After the war's first year, they were augmented and three machine-gun companies were formed per division, with a fourth added in 1917. In contrast, the United States would field only four machine guns per three-battalion infantry regiment.

The first 12 US divisions to reach France in early 1917 were given Hotchkiss 8mm M1914 machine guns. The American Expeditionary Forces would not be able to take the superior M1917 into combat until late September 1918, six weeks before the war ended. (US Army)



After the United States declared war on the Central Powers on April 6, 1917, there was a rush to acquire machine guns – a great many were needed, as US observers visiting the Western Front learned. No US commercial manufacturer or military arsenal possessed the capability to produce what was required. The fewer than 1,600 guns on hand were pressed into service as training weapons and even more of these obsolescent weapons were purchased for training.

The Machine Gun Officer's Training School was established at Camp Hancock near Augusta, Georgia, but few of the officer graduates made it to France before the Armistice. Training was hampered by insufficient numbers of guns, spare parts, and instructors. In France, crews were trained by instructors from the States, including John Browning's son, 1st Lieutenant Val A. Browning. During World War I machine-gunnery was highly technical, with specialist schools for officers and enlisted men. Machine-gun officers were assigned to division and brigade staffs. Machine-gunners were instilled with the attitude that they had to return with their gun, even if it was damaged. In contrast, by World War II, machine guns and their tactics would be fully integrated into units, and no longer treated as highly specialized weapons; training would be conducted within units.

Another problem was that the available guns were often inadequate for the task. The most numerous, the Benét-Mercié, was the most problem-plagued and was totally unsuited for the HMG role. Most were obsolescent at best, complex in design, and expensive to produce. None other than the Vickers would see combat in the hands of US infantrymen during World War I.

1st Lieutenant Val A. Browning demonstrates his father's invention to machine-gunners of the 80th Division in France. This weapon is fitted with the little-used M1917 flash hider. The leather accessory pouch can be seen strapped to the tripod's trail leg. (Tom Laemlein/Armor Plate Press)





As a result, the first 12 US divisions reaching France in early 1917 were provided with the French Hotchkiss Mle 1914, chambered for the less-than-ideal 8mm Lebel. The two Marine regiments and one machine-gun battalion deployed to France with the Army's 2nd Division were ordered to turn in their Lewis guns to be converted to aircraft guns and received inferior Hotchkiss and Chauchat guns instead. The next 11 US divisions deployed with the Colt-made Vickers M1915. The last divisions, arriving after June 1918, may have deployed partly armed with Browning M1917s, but most did not receive them until after they arrived.

In 1917 an infantry division possessed 14 machine-gun companies, each with three platoons for a total of 12 guns plus four spares. In World War I – and throughout the period covered by this book – HMG platoons had two sections of two squads, one gun per squad, four guns to a platoon. The M1917 HMG squad consisted of a corporal squad leader, gunner, assistant gunner, and five ammunition bearers, all armed with pistols. The breakdown was two brigade machine-gun battalions of four companies each, and they could be attached to the brigade's two infantry regiments as necessary, usually two companies per regiment. Additionally, each of the division's four regiments had a machine-gun company. One platoon could go to each battalion, but often the regimental company was attached to one battalion and the two attached brigade companies to the other two battalions. There was also a divisional motorized machine-gun battalion

A Marine crew of an M1917 prepares to open fire at Parris Island, South Carolina. Only a small number of the guns saw action in the war's last two weeks. The bronze water-jacket end cap is noticeable, along with the M1 water chest. The wooden ammunition box is an M1917A1 – note the angled lower left corner to accommodate the M1918 tripod. The M1917 box had a squared corner. (Tom Laemlein/Armor Plate Press)



Pre-World War II maneuvers near Camp Pine, New York; a 28th Division light truck parked in town mounts a .30-caliber M1917A1. "CAL 50 AT" has been stenciled in white on the water jacket as a maneuver substitute for a .50-caliber M2 HMG, which at the time was employed as a light antitank weapon. (Tom Laemlein/*Armor Plate Press*)

with two companies. It served as a mobile reserve and protected the division headquarters and rear-area installations often employed for antiaircraft defense. The three-regiment divisional artillery brigade had another 36 guns for firing battery and observation balloon protection.

The M1917 saw its first action on September 26, 1918 in the Meuse–Argonne Forest. Some had been issued to units that moved into the line on the 13th. The Armistice was on November 11; most divisions in Europe received their guns after the Armistice or in the first months of 1919. After the demobilization, all remaining Army and Marine units were equipped with the M1917 and the bulk were placed in storage.

WORLD WAR II

After World War I the brigade and divisional battalions disappeared in US divisions. Army infantry battalions lost their fourth rifle company and received a machine-gun company, although it had only two platoons. It was found in World War I that HMGs were most effectively employed under infantry-battalion control. This gave the smaller postwar "square" division, with four infantry regiments, a total of 12 machine-gun companies, only two fewer than assigned during the war, and now more effectively assigned to the infantry battalion. In 1939 the battalion machine-gun company was redesignated the heavy-weapons company

(companies D, H, and M), each with two HMG platoons and an 81mm mortar platoon. This structure remained in use through World War II.

By 1941 the Army HMG squad had four rather than five ammunition bearers and in February 1944 the squad leader, initially a corporal, was made a sergeant. The squad leader was now armed with an M1 rifle with M7 grenade launcher, the machine-gunner and his assistant with pistols, and the ammunition bearers with M1 carbines, one with an M8 grenade launcher. The section was commanded by a sergeant – a staff sergeant from February 1944. Army LMG organization differed markedly, however. When the Army added M1919A4s to rifle companies, a weapons platoon was created in 1939 with a four-squad LMG section and a 60mm mortar section. This was reduced to only two LMGs in the section in late 1940, and this would remain the case until 1948. This was rather limited as it only gave one gun to the two forward rifle platoons, or they could operate as a section; a third gun would have provided more flexibility. The LMG squad consisted of a corporal (sergeant in 1944) squad leader with rifle, gunner and assistant with pistols, and two ammunition bearers with carbines.

Armored infantry battalions assigned to armored divisions had a machine-gun platoon in the headquarters company. Its platoon headquarters had an M3 halftrack plus two more, one for each section. Both of the section's five-man squads rode in one halftrack. The halftracks were armed with .50-caliber weapons, but the platoon's four squads each

Paratroopers place an M1919A4 into action shortly after landing. The machine gun and ammunition were dropped in separate airdrop containers. Once located, the gun could be unpacked and put into action in 3–4 minutes. (Tom Laemlein/Armor Plate Press)





SHUMATE
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had an M1919A4 – an M1917A1 in some instances – that could also be mounted in the halftrack, but was intended to be operated while dismounted. Armored infantry units used their halftracks to maneuver on the battlefield and advance, but mainly fought dismounted. The armored infantry rifle company's three rifle platoons each had a machine-gun squad with two M1919A4s, unique to the armored infantry.

World War II-era parachute regiments had a very different machine-gun allocation. The rifle company had three rifle platoons and no weapons platoon. Each of the platoon's two rifle squads (increased to three by 1944) had an M1919A4 (an M1919A6 from late 1944), plus a spare to use in the defense. The spare M1919A6s were replaced by BARs between 1944 and 1945. The battalion headquarters company had an LMG platoon with four two-gun sections. The sections could augment rifle companies or provide general support, but lacked the long-range capability of the M1917A1, which parachute units lacked altogether. After the war parachute regiments, now redesignated airborne, would be organized and armed as conventional regiments.

During World War II, the USMC infantry battalion possessed a weapons company with three four-gun HMG platoons (each with four reserve guns), plus an 81mm mortar platoon. The Marines found the M1917A1 to be of marginal value on rugged islands when they were primarily employed in the attack. They lost their reserve HMGs in early

Sergeant Basilone's Medal of Honor (previous pages)

On October 24 and 25, 1942, Sgt John Basilone (1916–45), a machine-gun section leader of Company D, 1st Battalion, 7th Marines, 1st Marine Division – attached to his battalion's Company C – fought off repeated attacks by six Japanese infantry battalions supported by artillery and tanks. Basilone's two M1917A1 Brownings were hastily dug in on the east bank of the meandering Matanikau River. By the second night, the 15-man section had been cut down to Basilone and two men. One gun was damaged and Basilone personally brought up a reserve gun. He repeatedly repaired and cleared malfunctions, reset headspacing, returned to the rear to carry armloads of 14lb ammunition belts to the positions, and cleaned mud and dirt off the belts. He operated the guns to relieve his remaining men and shot bayonet-welding Japanese who had made it across the shallow river at pointblank range with his .45-caliber M1911A1 pistol. During the battle the Marines were under near-continuous artillery, mortar, and grenade-discharger fire along with rifle and machine-gun fire. In addition to all this, it rained heavily off and on. They were out of rations and had little drinkable water.

The far M1917A1 is one of the earlier guns with bronze barrel jacket caps. M1 water chests can be seen, along with a 7-quart filler canteen and a leather filling funnel. Brownings were normally bare gunmetal, but en route to Guadalcanal the Marines painted the tripods and barrel jackets forest green. The bronze jacket end caps may or may not have been painted over. While there were stoppages owing to excessive and long stretches of rapid fire, the guns performed well under extreme conditions of overheating, running out of water; rain, sand and mud; and no opportunity to clean the carbon build-up and fouling. Sergeant Basilone was presented with the Medal of Honor for his refusal to give up the key position, which proved instrumental in halting a major Japanese offensive.

1943. In April 1944 the Marines underwent a major reorganization. The battalions lost their weapons company, with the 81mm platoon going to the headquarters company and the machine-gun platoons merging with the rifle-company weapons platoons to create a new company machine-gun platoon – the 60mm mortars were moved to the company headquarters. The new rifle-company machine-gun platoon consisted of three two-squad sections, giving it six M1919A4s plus six reserve M1917A1s. A mix of LMGs and HMGs could be manned as required. With respect to LMGs, the USMC initially used a company weapons platoon organization similar to the Army, two M1919A4s and two 60mm mortars, but received one more of each in early 1943. The early 1944 reorganization gave the new machine-gun platoon six LMGs and six reserve HMGs.

World War II would see the widespread use of aircraft Brownings as ground guns. During the fall of the Philippines between 1941 and 1942, it was not uncommon for M2s to be removed from damaged and inoperable aircraft, fitted with ad hoc mounts, and used by the infantry. Later in the war the AN-M2 was employed in another manner. The use of the AN-M2 in the role of a light assault machine gun may have begun on Guadalcanal in early 1943. With ground personnel dissatisfied with limitations of the tripod-mounted M1919A4 during mobile operations in dense hilly jungles, some M2s were apparently removed from crashed Dauntless SBD dive-bombers and used on M2 tripods. They were also used on Bougainville in late 1943 by personnel of the 3rd Marine Division, who retained the spade grips and mounted them on recoil-buffered aircraft cradles on ground mounts. The Marines conducted a prolonged defense of an enclave there and the guns increased the defenders' firepower.

Those AN-M2s were employed in the defense. One Marine, Private William H. Colby, attached a BAR bipod to an AN-M2, but retained the spade grips. Two offensively minded Marines of the 3rd Parachute Battalion on Bougainville decided to modify the guns to make them more mobile for offensive operations. Sergeant Mel J. Grevich, leading the machine-gun section, and his weapons-platoon leader, Lieutenant Phillip Gray, set about modifying six AN-M2s when the battalion was returned to the States, disbanded, and the two paratroopers reassigned to Company G, 3rd Battalion, 28th Marines of the new 5th Marine Division bound for Iwo Jima. One gun went to each of the company's rifle platoons, one to the demolitions section, and one was carried by Grevich. The sixth Stinger went to Corporal Tony Stein of Company A, 1st Battalion, 28th Marines. It is not known why the sixth gun was given to a man in another battalion, except that Stein had a reputation as an aggressive fighter and had probably known Grevich and Gray in the 3rd Parachute Battalion. Stein is often incorrectly credited with having developed what became known as the "Stinger." Regardless, Stein went on to posthumously receive the Medal of Honor owing to his use of the Stinger.

The Stinger had a BAR carrying handle and BAR bipod fitted to the barrel jacket forward of the receiver. A front sight was fitted forward of the bipod and a BAR rear sight on the receiver. The double-spade handgrips were replaced by an M1 rifle butt stock on the backplate.

Stein's citation

For conspicuous gallantry and intrepidity at the risk of his life above and beyond the call of duty while serving with Company A, First Battalion, Twenty-Eighth Marines, Fifth Marine Division, in action against enemy Japanese forces on Iwo Jima, in the Volcano Islands, 19 February 1945. The first man of his unit to be on station after hitting the beach in the initial assault, Corporal Stein, armed with a personally improvised aircraft-type weapon, provided rapid covering fire as the remainder of his platoon attempted to move into position and, when his comrades were stalled by a concentrated machine-gun and mortar barrage, gallantly stood upright and exposed himself to the enemy's view, thereby drawing the hostile fire to his own person and enabling him to observe the location of the furiously blazing hostile guns. Determined to neutralize the strategically placed weapons, he boldly charged the enemy pillboxes one by one and succeeded in killing twenty of the enemy during the furious single-handed assault. Cool and courageous under the merciless hail of exploding shells and bullets that fell on all sides, he continued to deliver the fire of his skillfully improvised weapon at a tremendous rate of speed, which rapidly exhausted his ammunition. Undaunted, he removed his helmet and shoes to expedite his movements and ran back to the beach for additional ammunition, making a total of eight trips under intense fire and carrying or assisting a wounded man back each time. Despite the unrelenting

savagery and confusion of battle, he rendered prompt assistance to his platoon whenever the unit was in position, directing the fire of a half-track against a stubborn pillbox until he had effected the ultimate destruction of the Japanese fortification. Later in the day, although his weapon was twice shot from his hands, he personally covered the withdrawal of his platoon to the company position. Stouthearted and indomitable, Corporal Stein, by his aggressive initiative, sound judgment and unwavering devotion to duty in the face of terrific odds, contributed materially to the fulfillment of his mission, and his outstanding valor throughout the bitter hours of conflict sustained and enhanced the highest traditions of the United States Naval Service.



ABOVE The "Stinger," a much-modified AN-M2 aircraft machine gun, as used by the 28th Marines. Six of these guns were used on Iwo Jima and the regiment recommended that one replace one of the rifle squad's three BARs. (USMC)

A longer trigger was fitted with a trigger guard. A detachable metal 100-round aircraft ammunition box was attached to the left side. It is estimated to weigh 26lb, considerably lighter than the M1919A4's 44lb with tripod and about 7lb lighter than the recently adopted M1919A6. It was heavier than a BAR, especially with 100 rounds, but to lay down the same amount of suppressive fire from a BAR would require four magazine changes. The Stinger's 1,200rds/min made it ideal for suppressing Japanese pillboxes with repeated short bursts into embrasures. It proved effective enough that the 28th Marines' after-action report recommended that one of each rifle squad's three BARs be replaced by a Stinger.

The 37th Infantry Division on Bougainville also made use of AN-M2s. It took too many seconds for a patrol meeting a sudden ambush to set up the tripod, mount the gun, and put it into action. The BAR was useful in such situations, but its 20-round magazine limited its ability to provide sustained fire. An AN-M2 would be secured to a plywood packboard along with a 250-round ammunition can with the belt already inserted and the weapon at half-cock. Standing upright, the gun's barrel protruded above the bearer's head. This caused snagging in vegetation. When engaged, the bearer would drop to the prone position oriented in the enemy's direction. He spread his legs and rested on his

elbows. The following gunner hit the ground behind the bearer, retracted the operating hand to full-cock the gun and immediately began firing. He would verbally direct the bearer to raise or lower the gun using his arms or to shift left or right. The muzzle blast was uncomfortable and the helmeted bearer clamped his hands over his ears. Being able to put the gun into action within seconds and lay down such a high volume of fire often made for short firefights. One problem encountered by infantry using AN-M2s was acquiring ammunition in linked-metallic belts. Web belts often jammed when firing in a gun with twice the rate of fire for which the belts were intended. Since fighters were based on the contested island within days of the assault, they could usually scrounge sufficient linked ammunition.

KOREA AND VIETNAM

In 1948 the Army weapons company was reorganized to have a single machine-gun platoon with four M1917A1s and four M1919A4/A6s (plus 81mm mortar and 75mm recoilless rifle platoons). Only four guns were manned, though. In the defense and when supporting an attack with long-range fires, the HMGs were manned. When the platoon advanced with the rifle companies they would carry LMGs. There were, of course, situations in which combinations of light and heavy guns were manned. From 1951, when the United Nations' conduct of the Korean War focused on the defense of hills, all guns would be manned, by other personnel if necessary.

The Korean War-era M1919A6 crew consisted of a corporal machine-gunner and an assistant machine-gunner, both with pistols, and two ammunition bearers, one with an M1 rifle and the other with an M2 carbine. 25th Infantry Division, 1951. (Tom Laemlein/Armor Plate Press)





A hillside Marine M1917A1 HMG bunker in Korea. The large embrasure allowed a wide field of observation and fire, but made the gun and crew vulnerable. Even in daylight, the muzzle flash was highly visible against such a background. (Tom Laemlein/Armor Plate Press)

Turning to LMGs, in 1948 the Army company weapons platoon was reorganized with 60mm mortar and 57mm recoilless rifle sections. The rifle platoons received a weapons squad for the first time with one LMG and one bazooka. In 1953 the weapons squad received a second LMG and the bazooka was moved to the platoon headquarters. This allocation remained until the implementation of the Pentomic reorganization, the 1958–62 divisional structure optimized for the nuclear battlefield in which the three regiments and nine battalions were replaced by five smaller battle groups. The new weapons platoon was to have two M60 GPMGs and two 90mm recoilless rifles. These were substituted by M1919A6s and 3.5in bazookas until the new weapons began to be fielded in 1959–62. National Guard units still had M1919A6s into the 1960s and early 1970s.

Before the Korean War, the USMC went back to battalion weapons companies: two four-gun HMG platoons plus 81mm and bazooka platoons. The rifle companies retained an LMG platoon with three two-gun sections. Around 1960 the Marines again eliminated the battalion weapons company and the M1917A1 HMGs. The remaining crew-served weapons assets were assigned to the battalion headquarters company. The M1919A4s were eventually replaced by M60s.



The new West German *Bundeswehr* was largely armed with US-supplied weapons into the early 1960s. Here a *Maschinengewehr-Trupp* (machine-gun team) operates an M1919A6 – what they referred to as a “*Browning Maschinengewehr*.” (Tom Laemlein/Armor Plate Press)

FOREIGN USERS

Colt Firearms marketed Browning commercial models from the end of World War I to January 1942. They first offered a water-cooled ground gun, an air-cooled aircraft gun, and an automatic rifle (BAR), all designated the Model of 1919 (not to be confused with the later government M1919). The updated water-cooled gun was redesigned the Model of 1924 and in 1931 as the MG38 and MG38B based on the M1917. The MG38 had the M1917-style pistol grip and the MG38B had double-spade handgrips; there were also MG38T and BT tank guns with short barrels. The MG38-40, an aircraft gun based on the M2, used double handgrips. Earlier aircraft versions were the Models of 1930 and 1931. All aircraft models were based on the M2. (MG38 and MG40 were series designations and did not indicate a year.) They could be made in most popular military calibers.

To bolster sales, Browning offered a wide range of special features that could be added to guns. Export Brownings were mainly used by South American countries. The Model 1928 was made for Argentina in 7.65×53mm; it was fitted for a German Zeiss optical sight. A Model 1924 in 7×57mm was used by Guatemala, joined later by the .30-06 Model 1942. Mexico used the M1919 water-cooled gun in 7×57mm. Poland purchased modified MG38s as the Ckm wz. 30 in 7.92×57mm; they had a heavy-duty tripod, plus a special antiaircraft tripod with an elevation extender, tubular shoulder stock, and antiaircraft sights.

A few countries license-produced Browning water-cooled guns, mostly based on the MG38B. Most chose double handgrips and different types of tripods. Norway used the m/29I chambered for the special 7.92×61mm. Sweden produced the much-modified Browning water-cooled Ksp m/36 in 6.5×55mm, but converted to the powerful 8×63mm to achieve longer range.⁹ The air-cooled m/42B could be used on a bipod with folding tubular shoulder stock or on a tripod. Fabrique Nationale d’Armes de

⁹ Both Norway and Sweden used 6.5×55mm rifle cartridges, for which machine guns were also chambered. In order to achieve longer range and target effects, they also used larger-caliber, more powerful cartridges: 7.92×61mm and 8×63mm respectively. Interestingly, Swedish HMG crews were armed with special Mauser m/40 rifles in 8×63mm



Troops of the *Batallón Colombia* (four Colombian battalions were rotated to Korea between 1951 and 1954) man an M1919A6. While British and Australian forces in Korea used British weapons, Canadian, South Korean, and all United Nations units were armed with US weapons. (Tom Laemlein/Armor Plate Press)

Guerre (FN) of Belgium had produced Brownings for domestic use and export since 1930 and into the postwar years. The FN30 was manufactured in air-cooled ground, water-cooled, and aircraft versions in a variety of calibers for Argentina (7.65×53mm), China (7.92×57mm), Greece (6.5×54mm), the Netherlands (6.5×53mm), Siam (Thailand) (8×52mmR), and others. France used a 7.5×54mm aircraft version of it, the Mle 1938, in prewar American-supplied aircraft.

A Colt-made Argentine 7.65×53mm Model 1928 water-cooled machine gun fitted with antiaircraft sights and an improved muzzle booster to provide a more powerful and positive recoil thrust. (Tom Laemlein/Armor Plate Press)



Many countries the world over were armed with the M1919A4/A6 after World War II. It armed all United Forces in Korea, including some Commonwealth forces. Britain and Australia designated the M1919A4 fixed the L3A1, and the M1919A4 flexible the L3A2; the L3A3 and L3A4 were modifications of the former. Canada rechambered the M1919A4 fixed and flexible guns to 7.62mm NATO as the C1 and C1A1 respectively; the C5 and C5A1 were improved versions of the same. Austria called the M1919A4 the MG A4. In South Africa, the M1919A4 was manufactured as the MG4 by Lyttleton Engineering. Denmark designated the M1919A4 and M1919A5 the MG m/52-1 and MG m/52-11 respectively. The Israeli nomenclature was simply M1919, nicknamed the “zero three,” with many converted to 7.62mm NATO.



A Colt MG38 commercial machine gun for export sales. These were sold the world over from 1919 to 1942 in calibers to order. The most common calibers were .30-06, .303, 6.5mm, 7mm, 7.65mm, and 7.92mm, among others. (Tom Laemlein/Armor Plate Press)



IMPACT

Comparisons and legacy

The M1917 would see little use in World War I, but reports from the trenches were very favorable on all counts. There were instances where water jackets were penetrated by shrapnel and covered with mud, yet the guns still fired reliably. The most common of the World War I HMGs are examined in the following table.

World War I HMGs

Make/model (nation)	Caliber and operation*	Weight (gun)	Weight (with tripod)**	Length	Rate of fire and feed
Browning M1917 (USA)	.30-06; short recoil	35lb	52lb 8oz	40.8in	480rds/min; 250-rd web belt
Vickers Mk II (Britain)	.303in; short recoil	33lb	56lb	43in	450–550rds/min; 250-rd web belt
Maxim MG 08 (Germany)	7.92×57mm; short recoil	40lb 8oz	83lb	46.25in	400–500rds/min; 250-rd web belt
Maxim SPM-10 (Russia)	7.62×54mm; short recoil	52lb 8oz	99lb 11oz	43.6in	500–600rds/min; 250-rd web belt
Hotchkiss Mle 1914 (France)	8×50mmR;†† gas	55lb 11oz	60lb	51.6in	450–500rds/min; 24-rd and 30-rd strips
Schwarzlose M 07/12 (Austria–Hungary)	8×50mmR;†† blowback	44lb	43lb 11oz	42in	400rds/min; 250-rd web belt
Revoli Mod 1914 (Italy)	6.5×52mm; blowback	37lb 8oz	49lb 8oz	46.5in	450–500rds/min; 50-rd box magazine

* All these weapons were water-cooled except the air-cooled Hotchkiss.

** Weight does not include water, which added 6–8lb.

† The US-made Vickers M1915 was essentially the same weapon, but in .30-06.

†† The Austrian 8×50mmR Mannlicher and French 8×50mmR Lebel rounds were different and not interchangeable.



Browning automatic weapons dominated the American arsenal in World War II and Korea. In fact there were few non-Browning automatic weapons in the inventory, with the exception of submachine guns. Accordingly, veterans' accounts abound with stories of the .30-caliber Brownings' performance in combat situations.

The M1919 won a hard-earned reputation for rock-solid reliability. For example, during the vicious assault on Sugar Loaf Hill on Okinawa in 1945, a Marine operated an M1919A4 for four days straight without a single breakage, firing untold thousands of rounds with little cleaning. Similarly, a 45th Infantry Division machine-gunner in Italy fought off 80 attacking Germans, knocking out 25 with his M1919A4. Two Germans moved in close enough that he could not bring his gun to bear, so he killed them with his pistol. The surviving rifleman protecting the position was killed by a sniper. The gunner moved his gun to that position and took out the sniper. He covered the withdrawal of his platoon, was grievously wounded, but continued to man his gun until its firing was no longer heard by his withdrawing comrades. The next morning he managed to crawl back to American lines.

Even unusually cold conditions didn't necessarily impair the weapon's performance. During the American counterattack after the Ardennes offensive in 1944 and 1945, one machine-gunner reported that on many nights his M1919A4 and the ammunition belt were coated with ice. In the

An M1917A1 is fired during a night infiltration course, 1952. Trainees climbed out of a trench and low-crawled across a field with barbed wire and demolition charge pits toward four machine guns firing tracers over their heads. The guns were mounted on platforms and their traverse and elevation fixed. While trainees were told that the tracer streams were inches over their heads, they were actually set so that if a trainee stood up it would still fire over his head. (Tom Laemlein/Armor Plate Press)



A 37th Infantry Division M1917A1 crew in Manila has used furniture to raise the gun to window level and sandbagged the position. The gun is positioned well inside better to conceal muzzle flash and dust. (Tom Laemlein/Armor Plate Press)

morning he would open the feed cover, replace the frozen belt, which was defrosted and cleaned, then bang on the receiver and barrel to knock off most of the ice, and the weapon fired as usual. On one occasion he had to fire it with an iced belt. There were several stoppages, twice requiring the belt to be removed and ice wiped out with a scarf, and then firing continued.

The .30-caliber Browning also proved resilient when components did fail in combat situations. In Germany's Hürtgen Forest between 1944 and 1945, an M1919A4 squad of the 29th Infantry Division in a log bunker fought off five German counterattacks in three hours. During the course of the action, they had to replace and reset one burned-out barrel and replace a firing pin they salvaged from a destroyed gun. Part of the crew spent its time recovering ammunition from other positions and cleaning muddy belts.

The .30-caliber Brownings' relative simplicity also proved important. Unlike some Browning designs – the BAR, for instance – the “thirty Brownings” had a relatively small number of internal parts.¹⁰ Very few of these parts were small and fragile, another benefit. That said, none of the weapons possessed a quick-change barrel. They could be changed, but the weapons had to be partly dissembled to replace the barrel and its timing and headspace reset. This required special gauges, although there were expedient means of accomplishing this without gauges.

Brownings were known for their reliability, but as with any weapon, they had their flaws. The “thirties” did not exactly pour out a high rate of fire. The M1919 variants put out 400–550rds/min, the M1917A1 450–600rds/min, and the AN-M2 aircraft gun 1,000–1,350rds/min. (The AN-M2’s higher rate was necessary to raise the air-to-air hit probability.) The lower rates for ground guns was deemed to be satisfactory as it placed enough bullets into impact areas and conserved ammunition, unlike the German 7.92×57mm MG 34 and MG 42 machine guns with 800–900rds/min and 1,100–1,200rds/min respectively.¹¹ There were, of course, benefits deriving from such high rates, but the US armed forces preferred a lower rate, especially since Brownings lacked quick-change barrels. High firing rates also wore out barrels and moving parts faster.

They were comparatively heavy, but while a burden, their weight was also a benefit. Heavy barrels allowed them to provide longer sustained fire, made the tripod-mounted gun more stable for long-range firing, and made them more rugged. They didn’t shake themselves apart as did many lighter guns. There were complaints, too, that the LMGs were belt-fed, making it difficult to advance on foot. Magazine-fed weapons were better suited for this. However, that proved to be a benefit too. A 250-round belt allows a much greater rate of sustained fire without having to constantly change 20- or 30-round magazines. The LMG’s simple low tripod limited its utility and stability, but on the other hand, its lightness and compactness contributed to the guns’ maneuverability.

An M1919A4 position of 37th Infantry Division on Bougainville, 1944. The position serves both as a gun position and sleeping quarters. Rain was incessant and the overhead cover served as much to protect the gun as the crew. In such dense, close vegetation it did not take much firing to chop down a swath of vegetation. The gun would have to be repositioned, as the chopped-down vegetation pointed to the gun’s position and showed the enemy the sector of fire. (Tom Laemlein/Armor Plate Press)



11 See Chris McNab, *MG 34 and MG 42 Machine Guns*, Weapon 21, Osprey Publishing.

The Browning LMG's tactical flexibility also won plaudits on the battlefield. A paratrooper who fought in France explained that his platoon carried two M1919A4s and a BAR. The LMGs would be positioned on the ends of the platoon's line to cover the flanks and both could cover all or part of the front with the BAR in the center. When making contact with a patrol or outpost, the two LMGs both concentrated their fire on the enemy, typically firing 100–200 rounds each to wipe out or force the enemy to retreat.

There is no question that the .30-caliber Browning frequently had a decisive impact on enemy morale. German prisoners attributed the failure of their attack on Bastogne, Belgium in December 1944 in large part to the lavish expenditure of M1919A6 tracers by the defending 101st Airborne Division. All prisoners questioned stated that the illumination caused by the tracers made every German soldier feel that he could go no further without being spotted and that morale was lowered considerably because every tracer bullet “looked as if it were coming right at you.” Even German troops who had already seen five years of combat – including Stalingrad – commented that the display was more frightening than anything they had experienced.

This is not to say that US personnel always rated the .30-caliber Brownings above other – and sometimes even enemy – weapons. American soldiers were impressed with the German MG 34 and MG 42. These

World War II LMGs

Make/model (nation)	Caliber and operation*	Weight (gun)	Weight (with tripod)**	Length	Rate of fire and feed
M1919A4 (USA)	.30-06; short recoil	31lb	45lb	41in	400–550rds/min; 250-rd belt
M1919A6 (USA)	.30-06; short recoil	32lb 8oz		53in	400–500rds/min; 250-rd belt
M1918A2 BAR (USA)	.30-06; gas††	19lb 6oz		47.8in	300–450 or 500–650rds/min; ** 20-rd magazine
MG 34† (Germany)	7.92×57mm; short recoil	26lb 8oz		48in	800–900rds/min; 50-rd and 250-rd belts
MG 42† (Germany)	7.92×57mm; short recoil	25lb 8oz		48in	1,100–1,200rds/min; 50-rd and 250-rd belts
Mk II Bren† (Britain)	.303in; gas	23lb 3oz		45.6in	540rds/min; 30-rd magazine
DP Degtyarev (USSR)	7.62×54mmR; gas	23lb 4oz		50in	500–600rds/min; 47-rd drum
Type 96 (Japan)	6.5×50mmSR; gas	20lb		41.5in	550rds/min; 30-rd magazine
Type 99 Nambu† (Japan)	7.7×58mmSR; gas	23lb		46.75in	850rds/min; 30-rd magazine
Mod 30 Breda (Italy)	6.5×52mm; blowback††	22lb 12oz		48.5in	450–500rds/min; 20-rd magazine

* Tripod weight is provided only for the M1919A4, as the tripod was necessary to operate the gun; the others were fired from their bipods.

** The BAR could be set for low and high (antiaircraft) rates of fire.

† Only the Bren, Nambu, and the two German guns had quick-change barrels.

†† The BAR, Degtyarev, and Breda could be considered obsolescent at best.



A Marine M1919A4 is strapped to a plywood packboard, early 1950s. More often the gun and tripod were separated before strapping them on the packboard. This method allowed the gun to be set up more quickly. (Tom Laemlein/Armor Plate Press)

weapons, while having their own flaws, demonstrated several benefits not found in the Browning. With an integral bipod and shoulder stock, they were optimized for firing from the shoulder, underarm, and from prone in the squad LMG role. They could be set up on a special recoil-buffered mount and, coupled with an optical sight and additional spare barrels, used for long-range and indirect fire in the battalion HMG role. Their quick-change barrels, which required no adjustment after changing, proved extremely beneficial. In contrast the M1919A4, restricted to a tripod, made it difficult for crews to keep up with the rifle platoons they supported. The tripod limited the weapon's ability to be moved about a defensive position to cover different directions, or to maneuver in the attack, and was less than ideal when having to advance and fire uphill.

The .30-caliber HMGs would continue to prove their worth, even after World War II. A Korean War NCO described the employment of M1917A1s for fire support. When taking a fortified hill, an HMG section or platoon set one gun on the objective bunker and the others on adjacent

bunkers. After mortaring, the infantry closed in, with the guns firing repeated bursts into the embrasures after the guns were ranged and locked in position from several hundred yards. The guns were so accurate that assaulting riflemen moved to within a few yards of the targeted bunker as tracers streamed into the embrasure, signaled to cease fire, and threw grenades to take out the bunker – and then rolled up the other bunkers with the guns covering them.

Even after their front-line role was drawing down, the .30-caliber Brownings were valuable training aids. In spite of the fact that the “thirty-cal” was obsolete when he entered the Army in 1967, the author gained some experience on the M1919A6. While undergoing Phase I Special Forces training, the students were issued 7.62mm M14 rifles and .30-caliber M1919A6 machine guns rather than M16A1 rifles and M60 machine guns, simply – or so it was suspected – because the older weapons were heavier. The author, who had requested training as a weapons specialist, felt he might as well gain experience and volunteered to carry the M1919A6 during the first field exercise. Since there was no live firing involved, he learned little practical experience other than gaining an appreciation of its ruggedness and weight – 32lb 8oz as opposed to the M60’s 23lb 1oz. While not important in combat, it was also found that when firing blanks the Browning operated with complete reliability. Most other weapons were temperamental when firing blanks. Later during live firing they proved to be just as reliable.

The venerable .30-caliber Browning also remained a trusted weapon for static defense. In Vietnam the author was assigned to Chi Linh Special Forces Camp. The eight-sided camp had 18 M1919A6 machine guns on the outer perimeter, one in each of the 16 bunkers, with two bunkers having two guns. Another eight were positioned on the four-sided inner perimeter. These guns had their shoulder stocks removed, bipod legs folded, and were mounted on tripods. If they were kept clean and lightly lubricated, the timing and headspace reset after each cleaning, and occasionally test-fired, they always functioned. They were not carried on operations, though: lighter M60s were taken to the field. The M60 was an effective weapon, but the more robust Browning could lay down high rates of defensive fire for longer periods with few stoppages.



CONCLUSION

Considering the era, available manufacturing techniques, design principles, materials, prevailing tactics, and testing standards, the Browning machine guns proved to be extremely reliable, rugged, and versatile. John Browning started work on the system in 1899, essentially finalized it in 1910, and fielded a workable combat weapon in 1917. It saw use in a number of major wars – the two World Wars, the Korean War, and Vietnam – as well as dozens of smaller conflicts. They are still in limited use despite employing design principles and technology over 100 years old. There are not many weapons that can make that claim. Efforts to find a replacement for the Browning began early in World War II. It took another 15 years before it was found, and yet the Browning remained in fairly wide use for at least another 20 years.

Advances in both technology and tactical need eventually led to the demise of the .30-caliber Brownings. New materials, manufacturing means, and improved design trends led to lighter and cheaper machine guns in the late 1950s. One factor was the adoption of the 7.62mm NATO round. While the conversion of Brownings to this caliber was considered, it was the new manufacturing techniques and materials that led to lighter replacement weapons.

The M1917A1 was the first to go. The heavy, complex weapons were no longer compatible with the more agile and mobile post-World War II tactics, with units more dispersed. Its long-range indirect-fire capability was no longer necessary, owing to improved and more responsive mortar and artillery indirect-fire control – and recoilless rifles. The AN-M2 aircraft guns were withdrawn even earlier, being largely replaced by the .50-caliber in 1943 and altogether by the end of World War II. One Browning fixed aircraft version, the M37C, saw use in the 1960s aboard helicopters until it was replaced by the fixed M60C.



Filipino guerrillas display their colors along with a United States flag they had secreted away and saved for the return. Before them is an M1919A4 mounted on an M1917A1 tripod. The pre-invasion Philippine Army possessed only small numbers of M1919A4s and M1917A1s. Some M1919A4s were later delivered by submarine and others were supplied by liberating US forces. (Tom Laemlein/Armor Plate Press)

The 7.62mm M60 GPMG¹² was adopted in 1957 to replace the M1919A4 and M1919A6, but fielding the new weapon did not begin until 1959. The M60 was lighter and shorter than the M1919A6 – 23lb 1oz and 43¾in as opposed to 32lb 8oz and 53in. The M60 could be fired from the shoulder and hip, underarm, prone from its bipod, or from an M122 tripod. The tripod – a variant of the M1919A4's M2 – was less than ideal, though, for long-range indirect fire. The M60 remained the mainline infantry and helicopter machine gun, with improved versions fielded into the 1990s, eventually being replaced by the Belgium FN-designed 7.62mm M240-series guns (MAG 58), which had lost out to the M60 back in 1957.

It was a different matter with the Browning tank guns' replacement. The 7.62mm M73 machine gun was developed by Rock Island Arsenal, built by General Electric, and adopted in 1959. The weapon was a dismal failure, and even extensive revamping as the M219 in 1977 in an effort to save it offered little improvement. It was replaced by the coaxial version of the M240 in 1976 and even earlier by the M60E2 on a partial basis by the Marines.

M1919A4 variants remained in use from the end of World War II and well into the 1970s and even the 1980s with the forces of over 40 countries, probably more, as ground, vehicle, and aircraft guns. No doubt they can still be found in remote corners of the world.

12 See Kevin Dockery, *The M60 Machine Gun*, Weapon 20, Osprey Publishing.

GLOSSARY

BARREL JACKET	For M1919 guns this was a ventilated tube-like jacket protecting the recoiling barrel. For M1917 guns the larger jacket contained cooling water.
BOLT	The part of a firearm that closes the breech for firing, which holds the firing pin and assists feed and extraction of cartridges.
CANNELURE	A knuckled groove in a bullet's body in which the case mouth is crimped.
CHAMBER	The rear of the barrel in which a cartridge is seated to be fired.
CLOSED BOLT	A weapon's action when the bolt remains in the closed position after firing a burst. This prevents the chamber from cooling before firing the next burst. It could cause a chambered cartridge to explode, i.e. a cook-off (q.v.).
COAXIAL GUN	A machine gun mounted beside a tank's main gun and using the same sight.
CONDENSER	The rubber hose connecting the M1917 gun's water jacket and water chest (q.v.).
COOK-OFF	Caused when a cartridge remains in the weapon's chamber and the overheated barrel heats the cartridge to the point that the propellant ignites and could result in a runaway gun (q.v.).
FEED PAWS	Mechanical cams that pull the ammunition belt into the gun when firing.
HANGFIRE	A cartridge that does not fire immediately when struck by a firing pin, only doing so after a brief delay.
HEADSPACE	The distance between the bolt face and the cartridge's head (base) when seated in the chamber.
MUZZLE BOOSTER	A cap that was screwed onto the M1919's muzzle barrel bearing to trap propellant gas at the muzzle and increase the barrel's recoil force to ensure functional operation.
RECEIVER	The housing containing the weapon's main operating parts, bolt, feed, and firing and recoil mechanisms, the "action."
RUNAWAY GUN	Caused by a cook-off (q.v.), the overheated gun would continue to fire without the trigger being pulled.
SHORT RECOIL	A method of operation in which the barrel and action recoil a short distance. The barrel stops and the action continues rearward to reload the chamber; the action then returns forward, forcing the barrel forward.
SYNCHRONIZER	A timing device allowing a machine gun to be fired through an aircraft's propeller without striking the blades.
TIMING	The adjustment of the weapon so the firing occurs when the recoiling components are in the correct position.
T&E MECHANISM	The traversing and elevating mechanism allows adjustment of the gun's angle of fire and elevation along fixed lines for improved accuracy.
WATER CHEST	A metal container holding the water for the M1917 gun's cooling system.

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A soldier of the Japanese–American-manned 442nd Infantry Regimental Combat Team mans an M1919A6 on an M2 tripod with its sheet-metal shoulder stock removed. The 442nd, along with airborne units, was among the first to be issued the new LMG in late 1944. (Tom Laemlein/Armor Plate Press)





Troops on the firing line. This M1917 is fitted with the reinforcing stirrup on the underside of the receiver. Its ends extend $\frac{1}{2}$ in up the receiver's side and can be seen above the gunner's thumb. The M1917A1 tripods are anchored by large rocks rather than the usual sandbags. (Tom Laemlein/Armor Plate Press)

Official US Army manuals

A large number of field (FM) and technical (TM) manuals were published covering the various .30-caliber Browning machine guns. These are the most pertinent:

US Army, *Browning Machine Gun, Caliber .30, HB, M1919A4, Ground* (FM 23-45) (1940 and 1943)

US Army, *Browning Machine Gun, Caliber .30, HB, M1919A4 (Mounted on Combat Vehicles)* (FM 23-55) (1940 and 1942)

US Army, *Browning Machine Gun, Caliber .30, M1917* (FM 23-55) (1940)

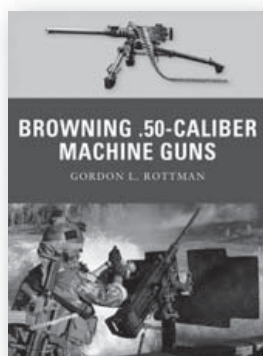
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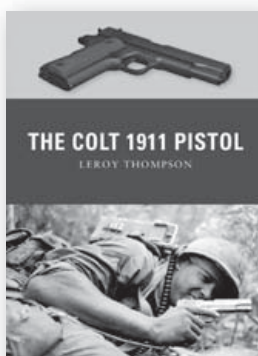
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These and other manuals are available from Military/Info Publishing (<http://www.military-info.com/Index.htm>)

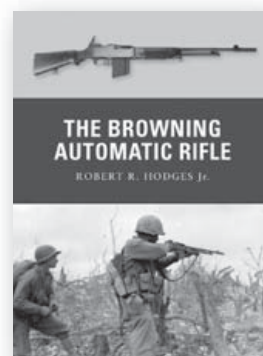
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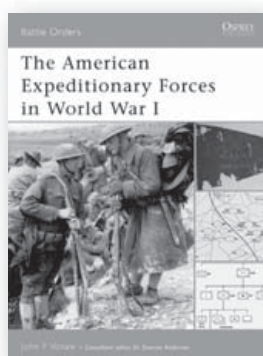


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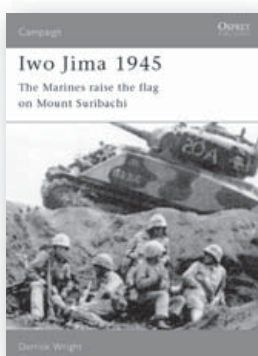


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First published in Great Britain in 2014 by Osprey Publishing,
PO Box 883, Oxford, OX1 9PL, UK
PO Box 3985, New York, NY 10185-3985, USA
E-mail: info@ospreypublishing.com

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A CIP catalog record for this book is available from the British Library

Print ISBN: 978 1 78096 921 3

PDF ebook ISBN: 978 1 4728 0803 5

ePub ebook ISBN: 978 1 4728 0804 2

Index by Alan Thatcher

Typeset in Sabon and Univers

Battlescenes by Johnny Shumate

Cutaway by Alan Gilliland

Originated by PDQ Media, Bungay, UK

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Acknowledgments

The author is grateful to Tom Laemlein of Armor Plate Press and the Texas Military Forces Museum, Austin for their photographic support.

Author's note

A mil is used for indicating azimuth (direction) and width of targets is 1/6400th of a circle. At 500yd a mil is ½yd (18in) wide and at 1,000yd, 1yd wide. In this book, metric cartridge designations are comprised of the approximate caliber in millimeters with the second number being the case length. Rimmed cartridges are further identified by an "R," semi-rimmed rounds by "SR," and belted cartridges (reinforcing band above the extraction groove) by a "B." Rimless cartridges have no letter identification.

Title page image: A jeep of Company M (Heavy Weapons), 3rd Battalion, 315th Infantry Regiment, 79th Infantry Division mounts an M1917A1 on an M24A1 pedestal mount at Camp Blanding, Florida, 1943. Normally they were provided an M48 dash mount. Each of the heavy-weapons company's eight HMG squads was provided a jeep for mobility. In practice the ten jeeps – each of the two platoons had a jeep in the headquarters – were often turned over to the battalion. (Tom Laemlein/Armor Plate Press)

Front cover images are courtesy of (top) Rock Island Auction Company and (bottom) Tom Laemlein/Armor Plate Press.

Abbreviations

AFV	armored fighting vehicle
AN-	Army/Navy (designation system)
AP	armor-piercing
API	armor-piercing-incendiary
BAR	Browning Automatic Rifle
FN	Fabrique Nationale d'Armes de Guerre
ft/sec	feet per second
GPMG	general-purpose machine gun
HMG	heavy machine gun
LMG	light machine gun
MG	machine gun (Colt commercial model designation)
OD	olive drab
rds/min	rounds per minute
T&E	traversing and elevating mechanism
USMC	United States Marine Corps